

Development of Ambient Water Quality Criteria for Benzene Metadisulfonic Acid, Benzene Monosulfonic Acid, p-Phenol Sulfonic Acid, and Resorcinol

Submitted to:

BABST, CALLAND, CLEMENTS, AND ZOMNIR
Pittsburgh, PA

Submitted by:

AMEC Earth & Environmental
Westford, Massachusetts

3 April 2008

TABLE OF CONTENTS

	Page
1.0 INTRODUCTION.....	1
2.0 PROCEDURES.....	6
2.1 MATERIALS AND METHODS	6
2.1.1 Organism Procurement and Handling	6
2.1.1.1 Daphnid	6
2.1.1.2 Fathead Minnow, Rainbow Trout and Bluegill	7
2.1.1.3 Amphipod and Midge Larvae	7
2.1.1.4 Rotifer	7
2.1.1.5 Mosquito Larvae	7
2.1.2 Bioassay Protocol.....	8
2.1.2.1 Daphnid & Fathead Minnow.....	8
2.1.2.2 Amphipod & Midge Larvae	8
2.1.2.3 Rainbow Trout & Bluegill.....	8
2.1.2.4 Rotifer	8
2.1.2.5 Mosquito Larvae	8
2.2 TEST DESIGN	9
2.2.1 Range-finding Tests	9
2.2.1.1 Daphnid Acute Survival	9
2.2.1.2 Daphnid Chronic Survival and Reproduction	10
2.2.1.3 Fathead Minnow Acute Survival	10
2.2.1.4 Amphipod & Midge Larvae Acute Survival.....	11
2.2.1.5 Rainbow Trout Acute Survival.....	12
2.2.1.6 Bluegill Acute Survival	12
2.2.1.7 Rotifer Acute Survival	13
2.2.1.8 Mosquito Larvae Acute Survival	13
2.2.2 Definitive Tests	14
2.2.2.1 Daphnid Acute Survival	14
2.2.2.2 Daphnid Chronic Survival and Reproduction	14
2.2.2.3 Fathead Minnow Acute Survival	15
2.2.2.4 Amphipod & Midge Larva Acute Survival.....	15
2.2.2.5 Midge Larvae Chronic Survival and Growth	15
2.2.2.6 Rainbow Trout Acute Survival.....	16
2.2.2.7 Bluegill Acute Survival	16
2.2.2.8 Rotifer Acute Survival	16
2.2.2.9 Rotifer Chronic Population Increase	16
2.2.2.10 Mosquito Larvae	16
2.2.3 Reference Toxicant Testing.....	16
2.3 STATISTICAL ANALYSES	17
3.0 DATA SUMMARIES.....	18
3.1 RANGE-FINDING TESTS	18
3.2 DEFINITIVE TESTS	18
4.0 RESULTS AND DISCUSSION.....	20

TABLE OF CONTENTS

	Page
REFERENCES	22

LIST OF TABLES

Table 1	Ambient Water Quality Data Requirements
Table 2	Relevant Resorcinol Toxicity Data from USEPA ECOTOX
Table 3	Relevant Sulfonate Toxicity Data from USEPA ECOTOX
Table 4..	Chemical and Species/Test type Matrix for Range-Finding and Definitive Test Series
Table 5	Summary of the Nominal Concentrations used for Reference Toxicant Testing - Copper (II) Chloride and Potassium Dichromate
Table 6	Summary LC ₅₀ and EC ₅₀ reported in mg/L
Table 7	Acute and Chronic Toxicity Test Results for the Test Compounds
Table 8	Acute to Chronic Ratio Calculations
Table 9	Ambient Water Quality Criteria Calculations

ATTACHMENTS

Attachment 1: Resorcinol Task Force 2004/2006 Studies

APPENDICES

Appendix A	Bioassay Survival and LC ₅₀ /EC ₅₀ Summaries
Appendix B	Bioassay Water Quality, Survival, and Statistical Summaries: Range-Finding Study
Appendix C	Bioassay Water Quality, Survival, and Statistical Summaries: Definitive Study
Appendix D	Copper (II) Chloride Reference Toxicant Data
Appendix E	Chain-of-Custody Forms

1.0 INTRODUCTION

Evidence exists that trace levels of the low molecular weight sulfonates, which may include benzene monosulfonic acid (BSA), p-phenol sulfonic acid (p-PSA) and benzene metadisulfonic acid (m-BDSA), are likely to be widespread in the environment. These compounds are present as constituents of the high-production detergents formulated from alkylbenzene sulfonates (Leslie, 1984) and other commercial products (Patel and Robbins, 1994). The widespread usage of these detergents since the 1940s in industrial, agricultural, and household applications has likely resulted in releases of these low molecular weight sulfonates. For example, benzene sulfonic acid has been qualitatively identified in drinking water in the United States by the Environmental Protection Agency (USEPA) (Abrams et al., 1975).

BSA and p-PSA are also found in surfactants used in the coal mining industry, in drilling fluid additives and in formulations for oil recovery operations. They are added to drilling muds as secondary emulsifiers to improve emulsion stability, as defoamers and as wetting agents for the drilled solids (Kjeilen et al., 1999).

Reuse of foundry sands for road construction and fill, as was common prior to 1980, is a documented source for BSA entry into the environment. Used foundry sand contains a mix of chemicals used in mold and core production. Benzene sulfonic acid is commonly used as a hardening agent (Ji et al., 2000; Matsura and Otsuka, 1987; Chang and Hurchings, 2001), and recent studies published in the scientific literature have documented that this chemical is readily leached into the environment when used foundry sand is exposed to environmental conditions. (Ji et al., 2000; Riediker et al., 2000). BSA was measured at 128 ug/l in leachate from a landfill where used foundry sand had historically been placed (Riediker et al., 2000).

Since the low molecular weight sulfonates are not in the suite of organic compounds routinely evaluated by the US Environmental Protection Agency (USEPA) standard analytical methods, they have rarely been included as target analytes for environmental investigations. Additionally, neither the USEPA nor the Commonwealth of Pennsylvania have developed Ambient Water Quality Criteria (AWQCs) for these compounds. The USEPA has established a specific protocol for developing AWQCs (Stephan et al., 1985), and the Commonwealth of Pennsylvania has adopted this protocol. As stated in 25 Pa. Code § 16.22:

The Department will establish criteria for toxic substances to provide for protection of aquatic life in accordance with the following guidelines:

- (1) For those toxics for which the EPA has developed criteria in accordance with the National guidelines as set forth in "Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses" (1985), the Department will review and evaluate the criteria. If the Department determines that the criteria are adequate to protect indigenous aquatic communities in the State's waters, these criteria will serve as the basis for establishing ...effluent limitations under Chapter 92 (relating to National Pollutant Discharge Elimination System permitting, monitoring and compliance). If the Department determines that the EPA National criteria are inappropriate, the Department will adjust these criteria in

accordance with National guidelines to reflect the levels required for protection of aquatic life in this Commonwealth's waters.

- (2) For those toxics identified or expected in a discharge for which the EPA has not developed criteria, the Department will develop criteria using the EPA's National Guidelines.

In developing acute AWQCs using the USEPA protocol as specified in item (1) above, Stephan *et al.* (1985) require acute toxicity test data from at least eight different families to represent the potential range of aquatic biota and their respective sensitivities to a compound that might be observed in the field. These eight data requirements are presented in Table 1, and typically, these data consist of 48-hr LC₅₀ data for *daphnids* and the 96-hr LC₅₀ data for fish (concentrations lethal to 50 percent of the test organisms after a 48- or 96-hour exposure period, respectively). These data are used to calculate the final acute value (FAV). The FAV is an estimate of the concentration of a chemical corresponding to a cumulative probability of 0.05 (i.e. the 5th percentile) of the acute toxicity values for the genera with which acceptable acute toxicity tests have been conducted for that chemical (Stephan *et al.*, 1985)

In addition to the data requirements for developing criteria using the USEPA method as adopted by Pennsylvania and specified in Table 1, toxicity test data from an algae or vascular plant are desirable, but not required, for calculation of the final plant value. Stephan *et al.* (1985) also specify that the final residue value (FRV) be determined where "the final Residue Value is intended to (a) prevent concentrations in commercially or recreationally important aquatic species from affecting marketability because of exceedance of applicable FDA Action Levels and (b) protect wildlife, including fishes and birds that consume aquatic organisms from demonstrated unacceptable effects."

The chronic AWQC can be derived using the same protocols if chronic toxicity test data for eight species are available. However, because chronic toxicity testing is expensive and time consuming, chronic criteria are typically developed by dividing the FAV by an acute to chronic ratio (ACR) developed from one or a few paired acute and chronic toxicity tests run in the same laboratory. The guidance developed by Stephan *et al.* (1985), used by USEPA and adopted by Pennsylvania, specifies three data requirements for developing an ACR:

1. At least one species is a fish
2. At least one species is an invertebrate
3. At least one species is an acutely sensitive freshwater species (the other two may be saltwater species).

If all three data requirements are met, then the final ACR is calculated as the geometric mean of the three values. USEPA (1995) has specified that in the absence of one or more ACR values, a default value of 18 should be substituted in the calculation of the final ACR. In the absence of any chemical-specific ACR information, the default value of eighteen is assumed to be the final ACR.

The FAV is divided by two to calculate the criterion maximum concentration (CMC). The FAV is divided by the final ACR to calculate the final chronic value. The criterion continuous concentration (CCC) is defined (Stephan *et al.*, 1985) as the lowest of the final chronic value,

the plant value, or the residue value. The CMC and the CCC are acute and chronic criteria, respectively, and are defined by Stephan *et al.* (1985) as:

The procedures described in the “Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses” indicate that, except where a locally important species is very sensitive, freshwater aquatic organisms and their uses should not be affected unacceptably if the four-day average concentration of the tested material does not exceed the Criterion Continuous Concentration more than once every three years on average and if the one hour concentration does not exceed the Criterion Maximum Concentration more than once every three years on average.

More recently, the USEPA (1995) has developed additional protocols for establishing wildlife criteria and has deleted the provision in the guidelines to use a Final Residue Value (FRV) in deriving a chronic criterion.

The initial source for data used in this study to identify preexisting chemical-specific toxicity test results is the USEPA ecotoxicology database (ECOTOX) (USEPA, 2003). ECOTOX is a source for locating single chemical toxicity data from three USEPA ecological effects databases: AQUIRE, TERRETOX, and PHYTOTOX. The AQUIRE database currently holds more than 232,000 records on lethal, sub-lethal and residue effects in aquatic species for over 7,300 chemicals. The database was most recently updated in February of 2006; however, the most recently posted data for resorcinol and/or the sulfonates were uploaded in the September 2003 update (USEPA, 2006).

For each chemical, ECOTOX was queried using the Chemical Abstracts Service Registration Number (CAS#). All records for aquatic plants and animals were downloaded in delimited report format. For aquatic species, the most appropriate toxicological endpoint for FAV derivation is the LC₅₀, the chemical concentration that was lethal to 50% of the test animals in a specified time period. As specified in Stephen *et al.* (1985), a 48-hour freshwater EC₅₀ (death or immobilization) and/or LC₅₀ is acceptable for *Daphnia* species. For fish, the 96-hour freshwater LC₅₀ for aquatic species was selected for derivation of the FAV. As also specified in the guidelines, when more than one freshwater LC₅₀ was available for several species within a genus, the geometric mean of all the data was calculated to represent the Genus Mean Acute Value (GMAV). The GMAVs were then used to calculate the FAV.

The relevant ECOTOX search records for each compound are presented in Tables 2 and 3. Highlighted records indicate data that met the USEPA AWQC guidelines calculation criteria, while records that are not highlighted were not included in any AWQC calculation. The rationale for not using data includes the following:

- Documentation codes which were classified as “I” (insufficient methods and results)
- Exposure times were less than or greater than USEPA (Stephan *et al.*, 1985) guidelines
- Effect endpoints or measurements which were mortality-based (e.g. percent survival or percent mortality rather than LC₅₀s) or concentration means were not recorded
- The test was conducted with saltwater media, or the medium was “Not Reported”
- Toxicity endpoints were “Not Reported”
- The data were inapplicable based on review of the original literature

A search of the database revealed no aquatic toxicity test records for m-BDSA. Consequently, to derive AWQCs for this compound, *de novo* bioassays were performed to meet all of the USEPA guideline criteria for the various genera presented in Table 1.

The ECOTOX query for BSA yielded only one result (Table 3); however, the data from this study could not be utilized because the test duration (>4 days) did not meet the 48-hr exposure guideline specified for a planktonic crustacean (*Daphnia magna*) in the USEPA guidelines. Consequently, to derive AWQCs for this compound, *de novo* bioassays were performed to meet all of the criteria for the various genera presented in Table 1.

The ECOTOX database contained ten records for p-PSA (Table 3). Of these, only two appeared to meet current USEPA testing guidelines for use in deriving AWQC based on test species and duration requirements (Stephan et al., 1985). One was a single 48-hr LC₅₀ for *Daphnia magna* and the second was a 96-hr LC₅₀ for *Lymnaea sp* (pond snail). Both of these LC₅₀s were published in a 1965 paper (Dowden and Bennett, 1965). Because these tests were conducted over 40 years ago and USEPA has specific aquatic toxicity test requirements for toxicity test results to be usable, the papers were reviewed in detail. A separate summary of the review is provided below for *daphnia magna* and pond snail.

Dowden and Bennett (1965) did not present details of the experimental methods for the *daphnia magna* tests. The authors cite a 1948 grey literature source that appears to no longer be available to the general public. Consequently, it was not possible to verify that USEPA guidelines were adhered to. Specifically, it was not possible to determine whether neonatal organisms (less than 24 hours old) were used in the test (as required by USEPA guidelines; Stephan et al., 1985; Section IV) or whether the animals were fed during the test (which is not allowed under the USEPA guidelines (Stephan et al., 1985; Section IV). It appears that the *daphnids* were fed based on review of cross-referenced articles cited in Dowden and Bennett (1965) for general methodologies. In addition, reference water was obtained from a university lake and though it may not be a variable between the spiked tests and the control, current protocols require laboratory derived water. Because of the factors above, the results from the Dowden and Bennett (1965) *daphnia* toxicity tests are not used in AWQC derivation.

Dowden and Bennett (1965) also reported a 96-hr LC₅₀ for *Lymnaea sp* (the pond snail). Detailed review of the article reveals the species of snail tested was not identified and minimal specific information is provided on the test protocols. As with the *daphnia magna* tests, reference water was obtained from a nearby waterbody and not generated in a laboratory, as current protocol requires. Because of these uncertainties, the data reported for the pond snail by Dowden and Bennett (1965) were not used to derive the AWQC for p-PSA. Only the *de novo* p-PSA test data (Table 7) were used.

The query for resorcinol yielded 37 relevant records covering twelve different species (Table 2). Some of these data satisfied seven of the eight existing USEPA acute aquatic toxicity test guideline criteria (Table 2) and therefore were used for the calculation of GMAVs and FAVs. Acute and chronic *Chironomus tentans* data were also run *de novo* to allow for calculation of an ACR.

In addition to the ECOTOX data, there were two very comprehensive bioassay test reports published by the Resorcinol Task Force (Springborn Smithers Laboratories, 2004; 2006) that utilized a full life cycle flow through test on the water flea *Daphnia magna* (25 – 400 ug/L

nominal; 11 – 172 ug/L measured) and an acute 72-hour test on the green alga *Pseudokirchneriella subcapitata* (3.1 – 100 ug/L nominal; 3 – 97 measured). The data from these reports are summarized in Attachment 1. There were no significant dose-related effects reported for either species, even at the highest doses, nor could any endpoints be calculated because of the lack of any discernable dose-response. The test endpoints included survival and reproduction in *Daphnia magna* (the latter of which appeared to be stimulated by resorcinol) and effects on growth and biomass in the green algae. Because the exposure concentrations were below the data obtained from ECOTOX and there were no clear dose-response relationships, these data were not used in the calculation of AWQCs. However, they are mentioned here to ensure that all existing reports are documented for the sake of completeness.

The remainder of this report summarizes the development of toxicity test information to satisfy all eight data requirements for calculating acute and chronic AWQCs for M-BDSA, p-PSA, BSA and, resorcinol¹. Section 3 presents the test organisms and the procedures used to develop the toxicity test information. Data summaries are presented in Section 4, and Results and Discussion are presented in Section 5.

¹ This report is a revision of a June 2005 report and includes recent chronic aquatic toxicity results from 2004 and 2006 tests sponsored by the Resorcinol Task Force (RTF) on *daphnia magna* and green algae (Springborn Laboratories, 2004; 2006). This revised report also includes toxicity data for p-PSA which were posted to ECOTOX in September 2003 (after preparation of the 2005 report). However, the results are from tests conducted in 1965.

2.0 PROCEDURES

A series of acute and chronic bioassays were conducted on four chemicals for up to eight species. An initial range-finding test was conducted for each species of interest to estimate a no-effect and a toxicity threshold. These data were then used to determine the range of concentrations for subsequent definitive testing. The chemicals tested were benzene metadisulfonic acid (m-BDSA), benzene monosulfonic acid (BSA), p-phenol sulfonic acid (p-PSA), and resorcinol. The species used for this study were the freshwater daphnid *Ceriodaphnia dubia*, the fathead minnow *Pimephales promelas*, the amphipod *Hyalella azteca*, the midge larva *Chironomus tentans*, the rainbow trout *Oncorhynchus mykiss*, the bluegill sunfish *Lepomis macrochirus*, the freshwater rotifer *Brachionus calyciflorus*, and the mosquito larvae *Culex pipiens* (Table 4). The rotifer tests were conducted in April 2003 at the AMEC Northwest Bioassay Laboratory located in Fife, Washington. All other testing was conducted between 27 November 2002 and 30 April 2003 at the AMEC San Diego Bioassay Laboratory (AMEC Laboratory), California.

2.1 MATERIALS AND METHODS

Chemicals m-BDSA, BSA, and p-PSA were sent to the AMEC Laboratory from AMEC's Westford, MA office. Westford obtained m-BDSA and p-PSA from ABCR GmbH & Co. in Germany (CAS#'s 831-59-4 and #825-90-1, respectively), and BSA from Aldrich Chemical (CAS# 515-42-4). The AMEC Laboratory obtained resorcinol from Sigma-Aldrich (CAS# 108-46-3) (Appendix E).

2.1.1 Organism Procurement and Handling

2.1.1.1 Daphnid

Ceriodaphnia dubia were cultured at the AMEC Laboratory. Four to five days prior to test initiation, adult female daphnids were isolated from batch cultures and placed in individual holding cups. The number of daphnids isolated was equal to the number of neonates required to initiate testing. Each cup contained 15 milliliters (ml) of dilution water. A diet consisting of vitamin-enriched yeast, Cerophyll®, and trout chow (YCT) and *Selenastrum* suspension was added to each cup daily. Cups were placed in a temperature-controlled room maintained at 25±1°C. Isolated females were transferred to cups containing fresh dilution water every 24 hours prior to test initiation. Females that produced broods of 8 or more neonates (<24 hours old) were isolated and their offspring combined in a single 500-ml crystallizing dish, fed, placed in an environmental chamber at 25±1°C, and held for two hours prior to test initiation.

2.1.1.2 Fathead Minnow, Rainbow Trout and Bluegill

Pimephales promelas larvae were obtained from Aquatic BioSystems in Fort Collins, Colorado. *Oncorhynchus mykiss* were obtained from Thomas Fish Supply in Anderson, California. *Lepomis macrochirus* were obtained from Osage Catfisheries, Inc. in Osage Beach, Missouri. Organisms were transported in oxygen-saturated water contained in plastic bags and shipped by overnight delivery service in insulated ice chests. Upon arrival at AMEC, organism receipt information was recorded, animal condition specified, and physical parameters including pH, DO, conductivity, and temperature were measured and recorded. The organisms were acclimated to test conditions in order to promote and confirm animal health prior to test initiation. During the acclimation period, animals were observed for any indications of stress (abnormal swimming behavior, discoloration) or significant mortality (>10%). The fathead minnows were fed freshly hatched brine shrimp (*Artemia* sp.). Rainbow trout and bluegill were fed Tetramin[®] flake food to satiation. Fathead minnow larvae were 12-14 days old post-hatch, rainbow trout were 16 days old, and bluegill were 60-90 days old upon test initiation.

2.1.1.3 Amphipod and Midge Larvae

Hyalella azteca and *Chironomus tentans* were obtained from Aquatic BioSystems in Fort Collins, Colorado. The amphipods were sorted by size class and placed in oxygen-saturated water contained in 500-ml plastic containers with fine screens at the bottom for use as a substrate. The midge larvae were placed in oxygen-saturated water contained in 500-ml plastic containers with paper towels as a substrate. All organism containers were packed into insulated ice chests and shipped by overnight delivery service. Upon arrival at AMEC, organism receipt information was recorded, animal condition specified, and physical parameters including pH, DO, conductivity, and temperature were measured and recorded. The organisms were acclimated to test conditions in order to promote and confirm animal health prior to test initiation. During the acclimation period, animals were observed for any indications of stress (abnormal swimming behavior, discoloration) or significant mortality (>10%), and fed a mixture of dilution water and Tetramin[®] flake food to satiation. Amphipods were 9-12 days old; midge larvae were in the second instar stage upon test initiation.

2.1.1.4 Rotifer

Brachionus calyciflorus cysts were obtained from MicroBioTests Inc. located in Deinze, Belgium. Dry cysts were shipped in 1 ml plastic vials and were received on 1 April 2003 (Lot BC000505, expiry 07/31/03). Cysts were stored in the dark at 4°C until use.

2.1.1.5 Mosquito Larvae

Culex pipiens were obtained from Carolina Biological Supply in Burlington, North Carolina. The larvae were placed in plastic bags filled with oxygen-saturated water and shipped in an insulated ice chest by overnight delivery service. Upon arrival at AMEC, organism receipt information was recorded, animal condition specified, and physical parameters including pH, DO, conductivity, and temperature were measured and recorded. The organisms were acclimated to test conditions in order to promote and confirm animal health prior to test initiation. During the acclimation period, animals were observed for any indications of stress (abnormal

swimming behavior, discoloration) or significant mortality (>10%), and fed a mixture of dilution water and ground trout chow.

2.1.2 Bioassay Protocol

2.1.2.1 Daphnid & Fathead Minnow

Acute *Ceriodaphnia dubia* and *Pimephales promelas* bioassays were conducted in accordance with USEPA protocols outlined in "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms," Fourth Edition (EPA/600/4-90/027F, 1993). Chronic *Ceriodaphnia dubia* bioassays were conducted in accordance with USEPA protocols outlined in "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms," Third Edition (EPA/600/4-91/002, 1994).

2.1.2.2 Amphipod & Midge Larvae

The USEPA protocols do not provide guidance for developing aquatic toxicity tests using amphipods and midge larvae. *Hyalella azteca* and *Chironomus tentans* bioassays were, therefore, conducted using procedures modified from USEPA protocols outlined in "Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates, Second Edition" (2000) and with American Society for Testing and Materials (ASTM) protocols outlined in "Standard Guide for Conducting Sediment Toxicity Tests with Freshwater Invertebrates," E 1383-94 (1994). The protocols in both of these documents were developed for sediment toxicity tests, so slight modifications of the procedures were necessary to accommodate water-only exposures.

2.1.2.3 Rainbow Trout & Bluegill

The USEPA protocols do not provide guidance for developing aquatic toxicity tests using early life stages of these species. Therefore, acute *Oncorhynchus mykiss* and *Lepomis macrochirus* bioassays were conducted in accordance with ASTM protocols outlined in "Standard Guide for Conducting Early Life-Stage Toxicity Tests with Fishes" (ASTM E1241-98).

2.1.2.4 Rotifer

The USEPA protocols do not provide guidance for developing acute or chronic aquatic toxicity tests using rotifers. Acute *Brachionus calyciflorus* bioassays were, therefore, conducted in accordance with ASTM protocols outlined in "Standard Guide for Acute Toxicity Test with the Rotifer *Brachionus*," (ASTM E1440-91). Chronic tests followed methods described in "A 2-day Life Cycle Test with the Rotifer *Brachionus calyciflorus*" (Snell, 1992).

2.1.2.5 Mosquito Larvae

The USEPA protocols do not provide guidance for developing aquatic toxicity tests using mosquito larvae. Therefore, acute *Culex pipiens* bioassays were conducted in accordance with ASTM protocols outlined in "Standard Guide for Conducting Acute Toxicity Tests on Test Materials with Fishes, Macroinvertebrates, and Amphibians" (ASTM E729-96).

2.2 TEST DESIGN

The test designs are summarized in the following sections.

2.2.1 Range-finding Tests

Daphnia, fathead minnow, amphipod, and midge larvae acute toxicity range-finding tests were conducted using the following concentrations: 0.1, 1.0, 10, 100, and 1,000 milligrams per liter (mg/L). Working stock solutions of 10,000 mg/L were made by weighing 10 g of each chemical into 1-L volumetric flasks and adding Nanopure deionized water. A chronic range-finding test with the same exposure concentrations was conducted using *Ceriodaphnia* only. Rainbow trout, rotifer, and bluegill acute toxicity range-finding tests were conducted using the following concentrations: 10, 100, 500, 1000, 5000, and 10,000 mg/L. Working stock solutions for these tests of 100,000 mg/L were made by weighing 100 g of each chemical into 1-L volumetric flasks and adding Nanopure deionized water.

2.2.1.1 Daphnid Acute Survival

One day prior to test initiation, a batch of moderately hard dilution water was prepared (eight parts Nanopure deionized water to two parts Perrier mineral water) and aerated overnight. The pH and hardness of the dilution water were measured and recorded to ensure that they were within the ranges designated in the protocol (pH 7.9 – 8.3; hardness 80 - 100 mg/L). Alkalinity was also measured and recorded to monitor its consistency in standard laboratory dilution water.

Thirty-ml polystyrene containers were used as test chambers. Three replicate cups were used for each concentration. Test chambers were placed in a polycarbonate holder with holes numbered sequentially from 1 to 18. A template that identified the test concentration and replicate contained in each hole was prepared and maintained.

Test solutions were prepared by measuring the appropriate amount of chemical stock solution into a volumetric flask and adding dilution water. The pH, DO, temperature, and conductivity in each test concentration were measured and recorded. Fifteen ml of test solution were distributed to each test chamber. Test chambers were placed in a 25°C environmental chamber to allow the solutions to equilibrate prior to test initiation. Upon initiation, five neonates were arbitrarily collected from the organism holding bowl and distributed to each test chamber. All counts were verified under a dissecting microscope. When initial observations were complete, the test was returned to the environmental chamber. Light was provided with cool-white fluorescent bulbs and maintained on a 16:8 hour light:dark cycle. Mortality was monitored for each test chamber at 24 and 48 hours. Measurements of the physical parameters pH, DO, conductivity, and temperature were recorded in each test concentration at the end of the 48-hour test in a composite sample comprised of the contents of the three replicate test chambers. The acceptability criterion for this test is mean control survival of 90 percent at exposure termination.

2.2.1.2 Daphnid Chronic Survival and Reproduction

One day prior to test initiation, a batch of moderately hard dilution water was prepared (eight parts Nanopure deionized water to two parts Perrier mineral water) and aerated overnight. The pH and hardness were measured and recorded to ensure they were within the ranges designated in the protocol. Alkalinity was also measured and recorded to monitor its consistency in our dilution water.

Thirty-ml polystyrene containers were used as test chambers. Five replicate cups were used for each concentration. Test chambers were placed in a polycarbonate holder with holes numbered sequentially from 1 to 30. A template that identified the test concentration and replicate contained in each hole was prepared and maintained.

Test solutions were prepared by measuring the appropriate amount of the chemical stock solution into a volumetric flask and adding dilution water. The pH, DO, temperature, and conductivity in each test concentration were measured and recorded. Fifteen ml of test solution were distributed to each test chamber. Test chambers were placed in a 25°C environmental chamber to allow the solutions to equilibrate prior to test initiation. Upon initiation, one neonate was arbitrarily selected from the organism holding bowl and distributed to each test chamber. The presence of a single neonate was verified under a dissecting microscope. When initial observations were complete, the test was returned to the environmental chamber. Light was provided with cool-white fluorescent bulbs and maintained on a 16:8 hour light:dark cycle. During the next seven days, each test chamber was monitored daily for offspring production, mortality, and sublethal effects. Daily renewals of test solution were made by transferring each adult to a new chamber containing fresh test solution of the corresponding concentration. After offspring counts were recorded, the used test solution was pooled by concentration and pH, DO, temperature, and conductivity were measured. At test termination, final observations were made, water quality parameters were recorded, and test animals were discarded. Control acceptability criteria for this test are mean survival of 80 percent and 60 percent of surviving females producing three or more broods with an average total of 15 neonates produced per organism.

2.2.1.3 Fathead Minnow Acute Survival

One day prior to test initiation, a batch of moderately hard dilution water was prepared (eight parts Nanopure deionized water to two parts Perrier mineral water) and aerated overnight. The pH and hardness were measured and recorded to ensure that they were within the ranges designated in the protocol. Alkalinity was also measured and recorded to monitor its consistency in our dilution water.

The test chamber used for the fathead minnow test was a 1-L plastic beaker. Two replicate cups were tested for each concentration.

Test solutions were prepared by measuring the appropriate amount of the chemical stock solution into a volumetric flask and adding dilution water. The pH, DO, temperature, and conductivity in each test concentration were measured and recorded. 250 ml of test solution were distributed to each test chamber. Test chambers were placed in a 20°C environmental

chamber to allow the solutions to equilibrate prior to test initiation. Upon initiation, ten healthy fish larvae were arbitrarily selected and placed in each test chamber. Counts and initial condition of all organisms were verified by a second technician. When initial observations were complete, the test was returned to the environmental chamber. Light was provided with cool-white fluorescent bulbs and maintained on a 16:8 hour light:dark cycle.

Mortality and observable sublethal effects were monitored and documented daily. Water quality parameters (pH, DO, temperature, and conductivity) were measured daily in one replicate from each test concentration. The test was performed under static conditions; there was no renewal of the test solutions. Animals were fed freshly hatched brine shrimp (*Artemia*) at 48 hours. At 96 hours, final water quality measurements were recorded, final counts and observations were documented, and the test animals were discarded. The acceptability criterion for this test is mean control survival of 90 percent at test termination.

2.2.1.4 Amphipod & Midge Larvae Acute Survival

One day prior to test initiation, a batch of moderately hard dilution water was prepared (eight parts Nanopure deionized water to two parts Perrier mineral water) and aerated overnight. The pH and hardness were measured and recorded to ensure that they were within the ranges designated in the protocol. Alkalinity was also measured and recorded to monitor its consistency in our dilution water. It is notable that moderately hard water is not typically the dilution water used for these two species. It was chosen for the range-finding phase of the study for consistency and comparability across species, but may have contributed to observed variability and was not used for definitive exposures.

Test chambers for these exposures were 1-L glass jars. Three replicate jars were used for each test concentration. *Hyalella* were provided with a 1 in² piece of fine-mesh screen as a substrate. *Chironomus* were provided with 2 tablespoons per replicate of clean rinsed beach sand collected from Torrey Pines Beach in La Jolla, CA.

Test solutions were prepared by measuring the appropriate amount of the chemical stock solution into a volumetric flask and adding dilution water. The pH, DO, temperature, and conductivity in each test concentration were measured and recorded. 250 ml of test solution were distributed to each test chamber. Test chambers were placed in a 20°C environmental chamber to allow the solutions to equilibrate prior to test initiation. Upon initiation, ten healthy-appearing *Hyalella* juveniles or *Chironomus* larvae were arbitrarily selected and distributed to the appropriate test chambers. Counts and initial condition of all organisms were verified by a second technician. When initial observations were complete, tests were returned to the environmental chamber. Light was provided with cool-white fluorescent bulbs and maintained on a 16:8 hour light:dark cycle.

Water quality parameters (pH, DO, temperature, and conductivity) were measured daily in one replicate from each test concentration. The test was performed under static conditions, there was no renewal of the test solutions. Animals were not fed during the 96-hour exposure period. At test termination, final water quality measurements were recorded, final counts and observations were made and documented, and test animals were discarded. Control acceptability criteria for *Hyalella* and *Chironomus* exposures are mean survival results of 80 and 70 percent, respectively at the end of the exposure.

2.2.1.5 Rainbow Trout Acute Survival

One day prior to test initiation, a batch of moderately hard dilution water was prepared (eight parts Nanopure deionized water to two parts Perrier mineral water) and aerated overnight. The pH and hardness were measured and recorded to ensure that they were within the ranges designated in the protocol. Alkalinity was also measured and recorded to monitor its consistency in our dilution water.

The test chambers were 1-L glass containers. Four replicate chambers each containing five organisms were used for each test concentration.

Test solutions were prepared by measuring the appropriate amount of the chemical stock solution into a volumetric flask and adding dilution water. The pH, DO, temperature, and conductivity in each test concentration were measured and recorded. 500 ml of test solution were distributed to each test chamber. Test chambers were placed in a 13°C environmental chamber to allow the solutions to equilibrate prior to test initiation. Upon initiation, ten trout were arbitrarily selected and to each test chamber. Counts and initial condition of all test organisms were verified by a second technician. When initial observations were complete, the test was returned to the environmental chamber. Light was provided with cool-white fluorescent bulbs and maintained on a 16:8 hour light:dark cycle.

Mortality and observable sublethal effects were monitored and documented daily. Water quality parameters (pH, DO, temperature, and conductivity) were measured and recorded daily in one replicate from each test concentration. The test was performed under static conditions; there was no renewal of the test solutions. Animals were not fed during the exposure. At 96 hours, final water quality measurements were recorded, final counts and observations were documented, and the test animals were discarded. The control acceptability criterion for this test is a mean survival of 90 percent at the end of the exposure.

2.2.1.6 Bluegill Acute Survival

One day prior to test initiation, a batch of Culligan-filtered water (Culligan) was prepared as dilution water and aerated overnight. Culligan was obtained from a city water line connected to a permanent series of filters. The filters are maintained on a regular service schedule.

The test chambers consisted of 1-L glass containers. Each concentration consisted of two replicate chambers with five organisms in each.

Test solutions were prepared by measuring the appropriate amount of the chemical stock solution into a volumetric flask and adding dilution water. The pH, DO, temperature, and conductivity in each test concentration were measured and recorded. 500 ml of test solution were distributed to each test chamber. Test chambers were placed in a 20°C environmental chamber to allow the solutions to equilibrate prior to test initiation. Upon initiation, ten bluegills were arbitrarily selected and placed into each test chamber.

Counts and initial condition of all test organisms were verified by a second technician. When initial observations were complete, the test was returned to the environmental chamber. Light was provided with cool-white fluorescent bulbs and maintained on a 16:8 hour light:dark cycle.

Mortality and observable sublethal effects were monitored and documented daily. Water quality parameters (pH, DO, temperature, and conductivity) were measured and recorded daily in one replicate from each test concentration. The test was performed under static conditions; there was no renewal of the test solutions. Animals were not fed during the exposure. At 96 hours, final water quality measurements were recorded, final counts and observations were made, and the test animals were discarded. The acceptability criterion for this test is a mean control survival of 90 percent at the end of the exposure.

2.2.1.7 Rotifer Acute Survival

Rotifer cyst hatching was initiated one day prior to starting the acute tests. A vial of cysts was rinsed into a Petri dish containing approximately 40 ml of moderately hard synthetic freshwater. The Petri dish was then placed in a 25°C environmental chamber under continuous light. Test chambers consisted of covered 48 multi-well tissue culture plates. There were three replicates per concentration in the range-finding tests.

Test solutions were prepared by measuring the appropriate amount of the chemical stock solution into a volumetric flask and adding dilution water. The pH, DO, temperature, and conductivity in each test concentration were measured and recorded. The test solutions were then distributed in 0.5 ml aliquots to wells in the test chamber. The culture plate was then placed in a 25°C environmental chamber to allow the solutions to equilibrate prior to test initiation. Rotifer cysts were distributed to test chambers within two hours of hatching. Five healthy appearing rotifer neonates were arbitrarily selected and distributed to each test chamber. Organisms were not fed during the test. Counts and initial condition of all organisms were verified by a second technician. When initial observations were complete, the multiwell plate was wrapped in aluminum foil to provide complete darkness and returned to the environmental chamber. Cups containing 100-ml of each test concentration for use in monitoring water quality parameters were prepared as surrogates, covered with aluminum foil, and placed in the environmental chamber.

Mortality was evaluated and recorded after 24 hours of exposure. Water quality parameters (pH, DO, temperature, and conductivity) were measured and recorded from each test concentration. The test was performed under static conditions; there was no renewal of the test solutions. The acceptability criterion for this test is a mean control survival of 90 percent at the end of the exposure.

2.2.1.8 Mosquito Larvae Acute Survival

One day prior to test initiation, a batch of Culligan dilution water was prepared and aerated overnight. The test chamber used for the mosquito larvae test was a 400-ml plastic beaker. Three replicate cups were tested for each concentration.

Test solutions were prepared by measuring the appropriate amount of the chemical stock solution into a volumetric flask and adding dilution water. The pH, DO, temperature, and conductivity in each test concentration were measured and recorded. 250 ml of test solution were distributed to each test chamber. Test chambers were placed in a 20°C environmental chamber to allow the solutions to equilibrate prior to test initiation. Upon initiation, five healthy

appearing larvae were arbitrarily selected and distributed to each test chamber. Counts and initial condition of all organisms were verified by a second technician. When initial observations were complete, the test was returned to the environmental chamber. Light was provided with cool-white fluorescent bulbs and maintained on a 16:8 hour light:dark cycle.

Mortality and observable sublethal effects were monitored and recorded daily. Water quality parameters (pH, DO, temperature, and conductivity) were measured daily in one replicate from each test concentration. The test was performed under static conditions; there was no renewal of the test solutions. Animals were fed a mixture of water and ground trout chow at 48 hours. At 96 hours, final water quality measurements were recorded, final counts and observations were documented, and the test animals were discarded. The control acceptability criterion for this test is a mean survival of 70 percent. A published acceptability criterion does not currently exist for this species. The 70 percent value was derived internally based on our experience with the organism and is equivalent to that recommended in EPA 2000 for another aquatic insect, *Chironomus tentans*.

2.2.2 Definitive Tests

Acute and chronic bioassays with daphnia and acute bioassays using fathead minnow, amphipod, and midge larvae were conducted with m-BDSA, BSA, and p-PSA. The concentrations tested were 500, 1,000, 2,000, 4,000, 8,000, and 10,000 mg/L. Working stock solutions of 100,000 mg/L were made by weighing 100 g of each of these chemicals into 1-L volumetric flasks and adding Nanopure filtered water. Acute and chronic bioassays for the midge larvae were conducted with resorcinol using concentrations of 100, 250, 500, 750, 1,000, and 2,000 mg/L. A working stock solution of 10,000 mg/L was made by weighing 10 g of resorcinol into a 1-L volumetric flask and adding Nanopure filtered water. Rainbow trout, bluegill, and mosquito larvae acute toxicity bioassay tests were conducted using the following concentrations of m-BDSA, BSA, and p-PSA: 10, 100, 500, 1000, 5000, and 10,000 mg/L. Working stock solutions for these tests of 100,000 mg/L were made by weighing 100 g of each chemical into 1-L volumetric flasks and adding Nanopure filtered water. Acute and chronic bioassays with rotifers were conducted with m-BDSA and BSA at concentrations of 625, 1,250, 2,500, 5,000, and 10,000 mg/L and with p-PSA at concentrations of 1,250, 2,500, 5,000, 10,000, 20,000 mg/L. Working stock solutions of 100,000 mg/L were made as for the daphnia tests.

2.2.2.1 Daphnid Acute Survival

Procedures for these bioassays were identical to those used for range-finding bioassays with two exceptions:

- 1) There were four replicate test chambers per test concentration rather than three; and;
- 2) Test chambers were placed in a polycarbonate holder with holes numbered sequentially from 1 through 28.

2.2.2.2 Daphnid Chronic Survival and Reproduction

Procedures for these bioassays were the same as those for range-finding bioassays with two exceptions:

- 1) There were ten replicate test chambers per test concentration rather than five and;
- 2) Test chambers were placed in a polycarbonate holder with holes numbered sequentially from 1 through 70.

2.2.2.3 Fathead Minnow Acute Survival

Procedures for these bioassays were the same as those used for range-finding tests with the exception of four replicate test chambers per test concentration rather than two.

2.2.2.4 Amphipod & Midge Larva Acute Survival

Procedures for these bioassays were the same as those used for range-finding tests with two exceptions:

- 1) There were five replicate test chambers per test concentration rather than three and;
- 2) Culligan was used as dilution water rather than moderately hard water. This is the typical dilution water for *Hyalella* and *Chironomus*.

2.2.2.5 Midge Larvae Chronic Survival and Growth

Test chambers for this bioassay consisted of 1-L glass jars. Five replicate jars were used for each test concentration. *Chironomus* were provided with 2 tablespoons of clean beach sand collected from Torrey Pines Beach in La Jolla, CA as a substrate. Dilution water consisted of Culligan water. The source of water was changed from range-finding exposure due to the possibility that the moderately hard dilution water preparation used during that phase of the study impacted animal survival and increased variability.

Test solutions were prepared by measuring the appropriate amount of the resorcinol chemical stock solution into a volumetric flask and adding dilution water. The pH, DO, temperature, and conductivity in each test concentration were measured and recorded. 250 ml of test solution were distributed to each test chamber. Test chambers were placed in a 20°C environmental chamber to allow the solutions to equilibrate prior to test initiation. Upon initiation, ten healthy appearing *Chironomus* larvae were arbitrarily selected and distributed to the appropriate test chambers. Counts and initial health of all organisms were verified by a second technician. When initial observations were complete, the test was returned to the environmental chamber. Light was provided with cool-white fluorescent bulbs and maintained on a 16:8 hour light:dark cycle. Mean initial weight of the *Chironomus* was determined by placing five arbitrarily selected organisms on five replicate-tared plastic pans. The pans were then placed in an oven at 65°C overnight and weighed the following day.

Water quality parameters (pH, DO, temperature, and conductivity) were measured daily in one replicate from each test concentration. The test was performed under static conditions; there was no renewal of test solutions. Animals were fed a mixture of Culligan and Tetramin® flake food every 2-3 days during the 10-day exposure period. At test termination, final water quality measurements were recorded, and final counts and observations were made. Surviving test animals then were transferred to tared plastic pans and placed in a drying oven at 65°C overnight. Dry weights were measured and the average growth per organism was estimated relative to the initial weight data collected on test day zero.

2.2.2.6 Rainbow Trout Acute Survival

Due to the results of the range-finding series, identical concentrations were used for the definitive series. Procedures for these bioassays were the same as those used for range-finding tests.

2.2.2.7 Bluegill Acute Survival

Due to the results of the range-finding series, identical concentrations were used for the definitive series. Procedures for these bioassays were the same as those used for range-finding tests with the exception of testing three replicates instead of two.

2.2.2.8 Rotifer Acute Survival

Procedures for these bioassays were identical to those used for range-finding bioassays with the exception of using eight replicate test chambers per test concentrations rather than three.

2.2.2.9 Rotifer Chronic Population Increase

Procedures for the chronic bioassays were identical to those used for range-finding bioassays with the following exceptions:

- 1) There were eight replicate chambers, rather than three;
- 2) There was one rotifer neonate added to each well in the tissue culture plate, rather than five;
- 3) Organisms were fed by adding 1×10^6 *Selenastrum capricornutum* cells per rotifer;
- 4) Final number of organisms in each test chamber was counted and recorded after 48 hours of exposure and rate of population increase was calculated; and
- 5) Test acceptability criterion was control performance of $r \geq 0.7$ (r is the intrinsic rate of population increase).

2.2.2.10 Mosquito Larvae

Due to the increased variability and low survival throughout the range-finding series, the definitive study was conducted using identical concentrations. Procedures for these bioassays were the same as those used for range-finding tests with two exceptions:

- 1) There were five replicate test chambers per test concentration rather than three and;
- 2) Larvae were fed daily.

2.2.3 Reference Toxicant Testing

Reference toxicant testing with copper (II) chloride was performed either concurrent to or within one week of all *Daphnia*, fathead minnow, *Chironomus*, and *Hyalella* range-finding and definitive tests. A concurrent reference toxicant test using potassium dichromate was conducted with the rotifer definitive tests. Reference toxicant testing is a quality

assurance/quality control (QA/QC) procedure performed to confirm the health and toxicant susceptibility of test organisms and demonstrate the use of proper and consistent test conditions and procedures (EPA 1993a). Test concentrations of reference toxicant material varied across species, and were based on past dose responses and lethal concentrations derived in the AMEC Laboratory (Table 5). Due to a lack of an internal reference toxicant database for bluegill, mosquito, and rainbow trout, reference toxicant testing was not conducted with these species.

2.3 STATISTICAL ANALYSES

For acute exposures (including reference toxicants), mean survival in each replicate was transformed into a percentage. Percentage data were arcsine square-root transformed to normalize the distribution of the data prior to statistical analysis. Normality of the data was checked with the Shapiro-Wilks Test. Steel's Many-one Rank Test, the Wilcoxon Rank Sum Test, or Dunnett's Test was used to identify significant differences between concentrations. For *Ceriodaphnia dubia* chronic bioassays, the Kolmogorov-Smirnov test was used to check the normality of the data. Survival data for *Ceriodaphnia* were evaluated with Fisher's exact P test, while the reproduction data were evaluated with either Steel's Many-one Rank Test, or the Wilcoxon Rank Sum Test. For the *Chironomus tentans* chronic exposure, normality of the data was checked using the Shapiro-Wilks test. Survival data were evaluated using Steel's Many-one Rank Test and differences in growth data were evaluated using Student's t-tests. Survival and net production/intrinsic population increase were evaluated for the *Brachionus* acute and chronic tests, respectively. The rate of intrinsic population increase (r) from the chronic rotifer data was calculated using the equation:

$$r = \ln N_t - \ln N_0 / T$$

where N_t is the number of rotifers after 2 days, N_0 is the initial number of rotifers, and T is the time of exposure (i.e. 2 days). Normality of data was checked using Shapiro-Wilk's Test prior to analyzing for variance using Bartlett's Test and comparing concentration response using Dunnett's test or Bonferroni t test. When no survivors were present in a concentration, the natural logarithm of the number of rotifers could not be calculated and used to determine EC_{50} values. In this case, net rotifer production was used following the same statistical steps outlined above.

LC_{50} values were calculated for all range-finding, definitive, and reference toxicant test sets that exhibited a dose-response curve. These endpoints were calculated with Probit, Trimmed Spearman-Kärber, or Linear Interpolation methods using ToxCalc Comprehensive Toxicity Data Analysis and Database Software, Version 5.0. The choice of statistical method was dependent upon specific model assumptions met or not met by the data as addressed in EPA (1993a).

3.0 DATA SUMMARIES

Test results are summarized in Table 6. Survival and LC₅₀/EC₅₀ summaries, rangefinder water quality data and statistics, definitive water quality data and statistics, and reference toxicant data are contained in Appendices A, B, C, and D, respectively. Chain-of-custody information is located in Appendix E.

Control criteria were met or exceeded for all tests conducted with the exception of the *Chironomus* range-finding tests with m-BDSA, BSA, and resorcinol. Controls for these tests were below the acceptability criterion of 70 percent survival. In this case, the control conducted with the concurrent p-PSA test was substituted for comparison purposes and reflects the same batch of animals and conditions.

All reference toxicant tests met control survival criteria. The LC₅₀ value calculated for all tests fell within internal control chart limits of \pm two standard deviations (Appendix D). This indicates that test organism sensitivity during this series of tests was similar to that of organisms historically tested at AMEC.

3.1 RANGE-FINDING TESTS

Two species, *Chironomus* and *Brachionus*, exhibited a significant response during the range-finding studies. Survival of *Chironomus* was zero percent in the highest concentration of resorcinol tested with an LC₅₀ of 86.7 mg/L. Survival of *Brachionus* was seven percent in the highest concentration of m-BDSA tested and 53 percent in the second highest tested. The calculated LC₅₀ for m-BDSA was 5190 mg/L. Although the calculated LC₅₀ for *Brachionus* in BSA was >10,000, it did exhibit a slight dose response to BSA with 53 percent survival in the highest concentration tested. No significant response was exhibited by any other species for any chemical tested during this phase.

3.2 DEFINITIVE TESTS

Three organisms, *Ceriodaphnia*, *Chironomus*, and *Brachionus* exhibited a dose response to the chemicals tested during the definitive assays. No significant response was exhibited by any other species for the chemicals tested during this phase.

The daphnids demonstrated both an acute and chronic response to the three chemicals tested. Mean survival of daphnids in the acute exposures was 10, 0, and 10 percent in the highest concentration tested (10,000 mg/L) for m-BDSA, BSA, and p-PSA, respectively (see Appendix Tables A-5, A-6, and A-7). Acute 48-hr LC₅₀ values of 6880, 4980, and 7500 mg/L were calculated for m-BDSA, BSA, and p-PSA, respectively. LC₅₀ values for the chronic tests were 3470, 5240, and 5280 mg/L for m-BDSA, BSA, and p-PSA, respectively. EC₅₀ values for the reproductive endpoint were 3440, 3080, and 1030 mg/L for m-BDSA, BSA, and p-PSA, respectively. It should be noted that *C. dubia* is known to be sensitive to waters with high conductivity. Recent experience in the AMEC laboratory, including a recent experiment specifically addressing this issue, suggests that levels above approximately 2000 mhos-cm can

impair survival and reproduction of *C. dubia*. Conductivities in the highest concentrations tested for m-BDSA, BSA, and p-PSA were well above levels expected to cause effects (approx. 5800, 4100, and 3100 mhos-cm, respectively).

Chironomus demonstrated both an acute and chronic response to one chemical, resorcinol. LC₅₀ values of 147 and 118 mg/L were obtained for acute and chronic exposures (see Appendix Table A-8). Due to the relatively low survival in the chronic exposure, an EC₅₀ value of >100 mg/L was calculated for the growth endpoint, so survival information should drive the use of this assay as a decision-making tool.

Brachionus demonstrated both an acute and chronic response to the three chemicals tested. Mean survival of rotifers in the acute exposures was zero percent in the highest concentration tested (10,000 mg/L) for all chemicals (see Appendix Tables A-5, A-6, and A-7). Acute 24-hr LC₅₀ values of 6598, 6950, and 10175 mg/L were calculated for m-BDSA, BSA, and p-PSA, respectively. Net 48-hour organism production for the chronic tests was 0.6, 0, and 0 organisms for the highest concentrations of m-BDSA, BSA, and p-PSA, respectively. EC₅₀ values for this endpoint were 7436, 6439, and 7873 mg/L for m-BDSA, BSA, and p-PSA, respectively. EC₅₀ values for the intrinsic population increase endpoint were 8907, >5000, and 9869 mg/L for m-BDSA, BSA, and p-PSA, respectively.

These results have been used to calculate genus mean acute values that are presented in Table 7 along with the corresponding data requirements from Stephan et al. (1985). Thus, for example, an acute LC₅₀ of 0.147 mg/L for the midge (*Chironomus tentans*) was developed for resorcinol specifically to complete the last data requirement that was not satisfied by literature values obtained from ECOTOX (Table 7). In addition, a chronic toxicity test was also performed to develop chronic values (Table 7) to calculate an ACR for resorcinol because suitable chronic toxicity test information was not found in ECOTOX.

4.0 RESULTS AND DISCUSSION

To derive an AWQC, acceptable aquatic toxicity tests results should be available to satisfy each of the eight requirements presented in Table 1. Review of the available literature in the USEPA ECOTOX database indicated that toxicity test data for resorcinol were available for twelve separate genera. Of these data, seven genera were applicable to satisfying the eight data requirements (Table 2). An acute LC₅₀ of 0.147 mg/L for the midge (*Chironomus tentans*) was subsequently developed specifically to complete the last data requirement that was not satisfied by the literature values obtained from the ECOTOX database (Table 7). In addition, a chronic toxicity test was also performed to develop chronic values (Table 7) that were needed to calculate an ACR for resorcinol because suitable chronic toxicity test information was not found in ECOTOX.

No useable data were found in ECOTOX for m-BDSA. One value was found for BSA (Table 3); however, the exposure time period for *Daphnia magna* was longer than the USEPA guidelines (Stephan et al., 1985). Ten ECOTOX records were found for p-PSA and two of the LC₅₀s initially appeared valid based on test organism and duration requirements (Stephan et al., 1985). One was a 48-hr LC₅₀ for *Daphnia magna* and the second was a 96-hr LC₅₀ for *Lymnaea sp* (pond snail). Both of these LC₅₀s were published in a 1965 article (Dowden and Bennett, 1965). Because these tests were conducted over 40 years ago and USEPA has specific aquatic toxicity test requirements for toxicity test results to be usable, the papers were reviewed in detail. Dowden and Bennett (1965) did not present details of the experimental methods for the *daphnia magna* tests. The authors cite a 1948 grey literature source that could not be obtained for review. Consequently, it was not possible to verify that USEPA guidelines or ASTM Standard Bioassay Testing protocols were adhered to. Upon review of cross-referenced articles cited in Dowden and Bennett (1965) for general methodologies, it was determined that enough uncertainty exists in the testing procedures to warrant exclusion of the Dowden and Bennett (1965) toxicity test results from the AWQC derivation. Specifically, it was not possible to confirm that neonatal daphnids were used in the test and that the *daphnids* were not fed during the test, as required by USEPA guidelines (Stephan et al., 1985). In fact, it does appear that the *daphnids* were fed based on review of the cross-referenced articles. Detailed review of Dowden and Bennett (1965) reveals that the exact species of pond snail tested was not identified and minimal specific information is provided on the test protocols. In addition, reference water was obtained from a university lake for both the daphnid and snail tests where current protocols require laboratory derived water. Because of these factors, the results from the Dowden and Bennett (1965) *daphnia* toxicity tests are not used in AWQC derivation.

Acute and chronic toxicity tests were conducted on eight test organisms specifically for developing an FAV for these three compounds. Both the preliminary and definitive acute aquatic toxicity tests indicated that, for most test organisms, acute toxicity was not observed at the highest concentrations of m-BDSA, BSA, and p-PSA tested (>10,000 mg/L). For these test organisms and compounds, the highest value tested was conservatively assumed to represent the LC₅₀ for calculating acute and chronic criteria. Acute LC₅₀ values were developed from the *Ceriodaphnia dubia* tests for m-BDSA (6,884 mg/L), BSA (4,984 mg/L), and p-PSA (7,497 mg/L). Table 7 presents the results for the acute and chronic toxicity tests performed with these compounds.

Because both acute and chronic toxicity tests were performed for three species, ACRs were calculated for m-BDSA, BSA, p-PSA, and resorcinol (Table 8). The ACRs ranged from less than one to 7.3, and all are much less than the default value of 18 assumed by USEPA (1995). Table 8 also presents the compound-specific ACRs that were developed for these compounds based upon the acute and chronic toxicity test results and the USEPA (1995) protocol.

The values presented in Tables 2, 7, and 8 were used with the procedures described by Stephan *et al.* (1985) to calculate FAVs, CMCs and CCCs for m-BDSA, BSA, p-PSA, and resorcinol (Table 9). Final CMCs (acute AWQC) and CCCs (chronic AWQC) for m-BDSA, BSA, p-PSA, and resorcinol are summarized below:

Compound	CMC (mg/L)	CCC (mg/L)
benzene metadisulfonic acid (m-BDSA)	2,592	1,620
benzene monosulfonic acid (BSA)	1,956	1,151
p-phenol sulfonic acid (p-PSA)	3,482	1,363
Resorcinol	28	7.18

The CMC and CCC values were developed according to established USEPA protocols which, in turn, have been adopted by the Commonwealth of Pennsylvania.

REFERENCES

- Abrams EF, Derkics D, Fong CV, Guinan DK, Slimak KM 1975. Identification of Organic Compounds in Effluents from Industrial Sources. USEPA 560/3-75-002. Prepared by Versar Inc. Springfield, VA
- AMEC. 2002. Kelly Farms Site Product Evaluation. June 2002 Test Series. AMEC Earth & Environmental San Diego Bioassay Laboratory
- AMEC. 2003. Water Quality Criteria Toxicity Evaluation of the Chemicals: Benzene Metadisulfonic Acid, Benzene Monosulfonic Acid, p-Phenol Sulfonic Acid, and Resorcinol. AMEC Earth & Environmental San Diego Bioassay Laboratory
- AMEC. 2005. Development of Ambient Water Quality Criteria for Benzene Metadisulfonic Acid, Benzene Monosulfonic Acid, p-Phenol Sulfonic Acid, and Resorcinol. AMEC Earth & Environmental, Boston, Massachusetts. June.
- ASTM. 1994. Standard Guide for Conducting Sediment Toxicity Tests with Freshwater Invertebrates, American Society for Testing and Materials (ASTM) E 1383-94.
- ASTM. 1996. Standard Guide for Conducting Acute Toxicity Tests on Test Materials with Fishes, Macroinvertebrates, and Amphibians, American Society for Testing and Materials (ASTM) E 729-96.
- ASTM. 1998. Standard Guide for Conducting Early Life-Stage Toxicity Tests with Fishes, American Society for Testing and Materials (ASTM) E 1241-98.
- ASTM. 1998. Standard Guide for Acute Toxicity Test with the Rotifer *Brachionus*, American Society for Testing and Materials (ASTM) E 1440-91.
- Bergman, H.L., and A.D. Anderson. 1977. Effects of Aqueous Effluents from In Situ Fossil Fuel Processing Technologies on Aquatic Systems. Contract No.EY-77-C-04-3913, University of Wyoming, Laramie, WY.
- Bringmann, G., and R. Kuhn. 1960. The Water-Toxicological Detection of Insecticides (Zum Wasser-Toxikologischen Nachweis von Insektiziden). *Gesund.Ing.* 8:243-244 (GER) (ENG ABS).
- Chang, K. K. and D. A. Hutchings. 2001. Furan no-bake foundry binders for sand molds and cores. 22 pp. U.S. Patent No. WO 2001081024 (Ashland, Inc. USA).
- Curtis, M.W., T.L. Copeland, and C.H. Ward. 1978. Aquatic Toxicity of Substances Proposed for Spill Prevention Regulation. In: *Proc.Natl.Conf.Control of Hazardous Material Spills*, Miami Beach, FL:93-103.
- Curtis, M.W., T.L. Copeland, and C.H. Ward. 1979. Acute Toxicity of 12 Industrial Chemicals to Freshwater and Saltwater Organisms. *Water Res.* 13(2):137-141.

Curtis, M.W., and C.H. Ward. 1981. Aquatic Toxicity of Forty Industrial Chemicals: Testing in Support of Hazardous Substance Spill Prevention Regulation. *J.Hydrol.*51:359-367 (Author Communication Used).

DeGraeve, G.M., D.L. Geiger, J.S. Meyer, and H.L. Bergman. 1980. Acute and Embryo-Larval Toxicity of Phenolic Compounds to Aquatic Biota. *Arch.Environ.Contam.Toxicol.* 9(5):557-568.

Dowden, B.F., and H.J. Bennett. 1965. Toxicity of Selected Chemicals to Certain Animals. *J.Water Pollut.Control Fed.* 37(9):1308-1316.

Ewell, W.S., J.W. Gorsuch, R.O. Kringler, K.A. Robillard, and R.C. Spiegel. 1986. Simultaneous Evaluation Of The Acute Effects Of Chemicals On Seven Aquatic Species. *Environ.Toxicol.Chem.* 5(9):831-840.

Freeman, L. 1953. Toxicity Thresholds of Certain Sodium Sulfonates for *Daphnia magna* Straus. *Sewage Ind.Wastes* 25(11):1331-1335.

Ji, S., Z. Fan, and P. Zu. 2000. The Chemical Characteristics and Leachability of Spent Foundry Sands. *The International Journal of Environmental Studies*, ISSN 1097-7104, Vol. 3, (2000).

Kjeilen, G., S.J. Cripps, A. Woodham, D. Runciman, and S. Olsen RF). 1999. UKOOA Drill Cuttings Initiative Research and Development Programme. Project 2.3: Natural degradation and estimated recovery time-scales. *Environment & Resource Technology Ltd.*, 130 pp., 773/654859.

Leslie, K.A. 1984. Brightener for detergents containing nonionic and cationic surfactants. U.S. Patent No. 446042 (The Proctor & Gamble Co., Cincinnati, OH)

Matsura, T. and S. Otsuka. 1987. Sand-mold binder. 5 pp. Japan Patent No. 62107840. (Dainippon Ink and Chemicals, Inc., Japan)

Patel, A., and C.R. Robbins. 1994. Hair-conditioning style-control shampoos containing cationic polymers and surfactants. 22 pp. U.S. Patent No. WO 9406410. Colgate-Palmolive Co., USA.

Reidiker, S., S. Ruckstuhl, M. J. F. Suter, A. M. Cook, W. Giger. 2000. p-Toluenesulfonate in Landfill Leachates: Leachability from Foundry Sands and Aerobic Biodegradation. *Environmental Science & Technology*, (2000), Vol. 34, 2156-2161.

Sangli, A.B., and V.V. Kanabur. 1998. Toxicity of Resorcinol and Nitrophenol to a Freshwater Fish *Lepidocephalus guntea*. *Environ.Ecol.* 16(3):642-644.

Snell, T.W., and B.D. Moffat. 1992. A 2-d Life Cycle Test with the Rotifer *Brachionus calyciflorus*. *Environmental Toxicology and Chemistry*. 11:1249-1257.

Springborn Laboratories, 2004. Resorcinol – Full Life Cycle Toxicity Test with Water Fleas, *Daphnia magna* Under Flow-Through Conditions. Submitted to Sumitomo Chemical Company , Ltd., 27-1 Shinkawa 2-Chome, Chuo-ku, Tokyo 104-8260 Japan. Performed by Springborn Laboratories, Wareham, MA. Laboratory Project ID 13048.6404. March, 2004.

Springborn Laboratories, 2006. Resorcinol – Acute Toxicity to the Freshwater Green Alga, *Pseudokirchneriella subcapitata*. Submitted to Sumitomo Chemical Company, Ltd., 27-1 Shinkawa 2-Chome, Chuo-ku, Tokyo 104-8260 Japan. Performed by Springborn Laboratories, Wareham, MA. Laboratory Project ID 13048.6404. March, 2006

Stephan, C.E., D.E. Mount, D.J. Hansen, J.H. Gentile, G.A. Chapman, and W.A. Brungs. 1985. Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses. USEPA Office of Research and Development, Environmental Research Laboratories: Duluth, MN; Narragansett, RI; and Corvallis, OR. PB85-227049

Trabalka, J.R., and M.B. Burch. 1978. Investigation of the Effects of Halogenated Organic Compounds Produced in Cooling Systems and Process Effluents on Aquatic Organisms. In: R.L. Jolley, H. Gorchev, and D.R. Hamilton, Jr. (Eds.), Water Chlorination: Environmental Impact and Health Effects: 163-173.

USEPA. 1993. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fourth Edition, United States Environmental Protection Agency, EPA/600/4-90/027F.

USEPA. 1994. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Third Edition, United States Environmental Protection Agency, EPA/600/4-91/002.

USEPA. 1995. Final Water Quality Guidance for the Great Lakes System: Final Rule 60FR15365.

USEPA. 2000. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates, Second Edition United States Environmental Protection Agency, EPA/600/R-99/064, March 2000.

USEPA. 2003. ECOTOX User Guide: ECOTOXicology Database System. Version 4.0. Available: <http://www.epa.gov/ecotox/> . September, 2003.

USEPA. 2006. ECOTOX User Guide: ECOTOXicology Database System. Version 4.0. Available: <http://www.epa.gov/ecotox/> . November 2006.

Van Leeuwen, C.J., E.M.M. Grootelaar, and G. Niebeek. 1990. Fish Embryos as Teratogenicity Screens: A Comparison of Embryotoxicity Between Fish and Birds. *Ecotoxicol. Environ. Saf.* 20(1):42-52.

Table 1
Ambient Water Quality Data Requirements

Acute Freshwater Animal (1)
a. The family Salmonidae in the class Osteichthyes
b. One other family (preferably a commercially or recreationally important, warmwater species) in the class Osteichthyes (e.g. bluegill, channel catfish)
c. A third family in the phylum Chordata (e.g. fish, amphibian)
d. A planktonic crustacean (e.g. a cladoceran, copepod)
e. A benthic crustacean (e.g. ostracod, isopod, amphipod, crayfish)
f. An insect (e.g. mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge)
g. A family in a phylum other than Arthropod or Chordata (e.g. Rotifera, Annelida, Mollusca)
h. A family in any order of insect or any phylum not already represented
Freshwater Plant
Results of at least one acceptable test with a freshwater algae or vascular plant is desirable but not required for criterion derivation. If plants are among the aquatic organisms most sensitive to the material, results of a test with a plant in another phylum (division) should also be available
Chronic Freshwater Animals
Acute-Chronic Ratios (ACRs) with at least one species of aquatic animal in at least three different families provided that of the three species (2):
a. At least one is a fish
b. At least one is an invertebrate
c. At least one species is an acutely sensitive freshwater species (the other two may be saltwater species)

Notes:

(1) Conducting all tests satisfies the requirements for calculating the final acute value.

(2) If fewer than three acceptable experimentally determined ACRs are available, use enough assumed ACRs of 18 so that the total number of ACRs equals three. Calculate the final ACR as the geometric mean of the three ACRs.

Table 2
Relevant Resorcinol Toxicity Data from USEPA ECOTOX

AWQC Data Requirements	Scientific Name	Common Name	Endpoint	Effect	Test Duration	ECOTOX Ref #	Author (Pub Year)	Doc Code	Conc Mean	GMAV (ug/L)	GMAV Used in AWQC? (i.e. lowest four)
a. The family Salmonidae in the class Osteichthyes	<i>Oncorhynchus mykiss</i>	Rainbow trout	EC50	DVP	60 d	2852	Van Leeuwen et al (1990)	C	260,000 ug/L	100,000	Yes
	<i>Oncorhynchus mykiss</i>	Rainbow trout	LC50	MOR	60 d	2852	Van Leeuwen et al (1990)	C	320,000 ug/L		
	<i>Oncorhynchus mykiss</i>	Rainbow trout	LC50	MOR	96 hr	569	DeGraeve et al (1980)	M	100,000 ug/L		
	<i>Oncorhynchus mykiss</i>	Rainbow trout	LOEC	MOR	60 d	2852	Van Leeuwen et al (1990)	C	320,000 ug/L		
	<i>Oncorhynchus mykiss</i>	Rainbow trout	LOEC	NOC	60 d	2852	Van Leeuwen et al (1990)	C	320,000 ug/L		
	<i>Oncorhynchus mykiss</i>	Rainbow trout	LOEC	GRO	60 d	2852	Van Leeuwen et al (1990)	C	100,000 ug/L		
	<i>Oncorhynchus mykiss</i>	Rainbow trout	LOEC	GRO	60 d	2852	Van Leeuwen et al (1990)	C	32,000 ug/L		
b. One other family (preferably a commercially or recreationally important, warmwater species) in the class Osteichthyes (e.g. bluegill, channel catfish)	<i>Pimephales promelas</i>	Fathead minnow	LC50	MOR	24 hr	5735	Curtis et al (1978)	M	88,600 ug/L	62,157	Yes
	<i>Pimephales promelas</i>	Fathead minnow	LC50	MOR	48 hr	5735	Curtis et al (1978)	M	72,600 ug/L		
	<i>Pimephales promelas</i>	Fathead minnow	LC50	MOR	96 hr	5735	Curtis et al (1978)	M	56,500 ug/L		
	<i>Pimephales promelas</i>	Fathead minnow	LC50	MOR	96 hr	5735	Curtis et al (1978)	M	49,500 ug/L		
	<i>Pimephales promelas</i>	Fathead minnow	LC50	MOR	24 hr	875	Curtis et al (1979)	C	88,600 ug/L		
	<i>Pimephales promelas</i>	Fathead minnow	LC50	MOR	48 hr	875	Curtis et al (1979)	C	72,600 ug/L		
	<i>Pimephales promelas</i>	Fathead minnow	LC50	MOR	96 hr	875	Curtis et al (1979)	C	53,400 ug/L		
	<i>Pimephales promelas</i>	Fathead minnow	LC50	MOR	96 hr	569	DeGraeve et al (1980)	C	100,000 ug/L		
	<i>Pimephales promelas</i>	Fathead minnow	LC50	MOR	96 hr	2965	Curtis and Ward (1981)	C	60,000 ug/L		
	<i>Pimephales promelas</i>	Fathead minnow	LC50	MOR	96 hr	11951	Ewell et al (1986)	C	40,000 ug/L		
c. A third family in the phylum Chordata (e.g. fish, amphibian)	<i>Lepidocephalichthyes guntea</i>	Fish	LC50	MOR	24 hr	19085	Sangli et al (1998)	C	80,000 ug/L	73,000	Yes
	<i>Lepidocephalichthyes guntea</i>	Fish	LC50	MOR	48 hr	19085	Sangli et al (1998)	C	77,000 ug/L		
	<i>Lepidocephalichthyes guntea</i>	Fish	LC50	MOR	72 hr	19085	Sangli et al (1998)	C	75,000 ug/L		
	<i>Lepidocephalichthyes guntea</i>	Fish	LC50	MOR	96 hr	19085	Sangli et al (1998)	C	73,000 ug/L		
	<i>Lepidocephalichthyes guntea</i>	Fish	LC50	MOR	96 hr	19085	Sangli et al (1998)	C	73,000 ug/L		
d. A planktonic crustacean (e.g. a cladoceran, copepod)	<i>Daphnia</i>	Water flea	LD50	MOR	48 hr	58990	Bringmann, G., and R. Kuhn (1960)	M	800,000 ug/L	282,843	No
	<i>Daphnia magna</i>	Water flea	LC50	MOR	96 hr	11951	Ewell et al (1986)	C	250 ug/L		
	<i>Daphnia pulex</i>	Water flea	LC50	MOR	96 hr	6256	Trabalka, J.R., and M.B. Burch (1978)	M	900 ug/L		
	<i>Daphnia pulicaria</i>	Water flea	LC50	MOR	48 hr	569	DeGraeve et al (1980)	M	100,000 ug/L		
e. A benthic crustacean (e.g. ostracod, isopod, amphipod, crayfish)	<i>Gammarus fasciatus</i>	Scud	LC50	MOR	96 hr	11951	Ewell et al (1986)	C	100,000 ug/L	100,000	Yes

Table 2
Relevant Resorcinol Toxicity Data from USEPA ECOTOX

AWQC Data Requirements	Scientific Name	Common Name	Endpoint	Effect	Test Duration	ECOTOX Ref #	Author (Pub Year)	Doc Code	Conc Mean	GMAV (ug/L)	GMAV Used in AWQC? (i.e. lowest four)
f. An insect (e.g. mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge)											
g. A family in a phylum other than Arthropod or Chordata (e.g. Rotifera, Annelida, Mollusca)	<i>Helisoma trivolvis</i>	Ramshorn snail	LC50	MOR	96 hr	11951	Ewell et al (1986)	C	100,000 ug/L	100,000	No
h. A family in any order of insect or any phylum not already represented.	<i>Dugesia tigrina</i>	Turbellarian, flatworm	LC50	MOR	96 hr	11951	Ewell et al (1986)	C	100,000 ug/L	100,000	No
Additional Aquatic Toxicity Test Data											
	<i>Danio rerio</i>	Zebra danio	EC50	DVP	7 d	2852	Van Leeuwen et al (1990)	C	54,800 ug/L		
	<i>Danio rerio</i>	Zebra danio	LC50	MOR	7 d	2852	Van Leeuwen et al (1990)	C	262,000 ug/L		
	<i>Danio rerio</i>	Zebra danio	LOEC	MOR	7 d	2852	Van Leeuwen et al (1990)	C	320,000 ug/L		
	<i>Danio rerio</i>	Zebra danio	LOEC	NOC	7 d	2852	Van Leeuwen et al (1990)	C	100,000 ug/L		
	<i>Asellus intermedius</i>	Aquatic sowbug	LC50	MOR	96 hr	11951	Ewell et al (1986)	C	100,000 ug/L	100,000	No
	<i>Lumbriculus variegatus</i>	Oligochaete, worm	LC50	MOR	96 hr	11951	Ewell et al (1986)	C	100,000 ug/L	100,000	No
Freshwater Plant Toxicity Test Data											
Results of at least one acceptable test with a freshwater algae or vascular plant.	<i>Elodea canadensis</i>	Waterweed	EC50	POP	9 d	14483	Stom, D.I., and R. Roth (1981)	M	143,143 ug/L	143,143	
	<i>Lemna minor</i>	Duckweed	EC50	POP	12 d	14483	Stom, D.I., and R. Roth (1981)	M	165,165 ug/L	165,165	

- Notes:
1. Data listed in this table are freshwater results with a Document Code of "C" or "M" and Endpoint Codes not "NR".
 2. Abbreviation/codes are as reported in ECOTOX (USEPA, 2006; <http://cfpub.epa.gov/ecotox/>).
 3. Highlighted rows indicate data that met the USEPA AWQC Guidelines (Stephan et al., 1985) for calculation of the GMAV and Final Acute Value (FAV).

Table 3
Relevant Sulfonate Toxicity Data from USEPA ECOTOX

Chemical Name	AWQC Data Requirements	Scientific Name	Common Name	Endpoint	Effect	Test Duration	ECOTOX Ref #	Author (Pub Year)	Doc Code	Concentration Mean
Sodium benzenesulfonate (BSA)	d. A planktonic crustacean (e.g. a cladoceran, copepod)	<i>Daphnia magna</i>	Water flea	LC ₅₀	MOR	4.2 d	8066	Freeman (1953)	M	2,840,000 ug/L
4-Hydroxybenzenesulfonic acid, Monosodium salt (p-PSA)	b. One other family (preferably a commercially or recreationally important, warmwater species) in the class Osteichthyes (e.g. bluegill, channel catfish)	<i>Lepomis macrochirus</i>	Bluegill	LC ₅₀	MOR	100 hr	915	Dowden and Bennett (1965)	M	19,616,000 ug/L
	d. A planktonic crustacean (e.g. a cladoceran, copepod)	<i>Daphnia magna</i>	Water flea	LC ₅₀	MOR	4.2 d	8066	Freeman (1953)	M	1,876,000 ug/L
		<i>Daphnia magna</i>	Water flea	LC ₅₀	MOR	24 hr	915	Dowden and Bennett (1965)	M	13,510,000 ug/L
		<i>Daphnia magna</i>	Water flea	LC ₅₀	MOR	48 hr	915	Dowden and Bennett (1965)	M	13,510,000 ug/L
		<i>Daphnia magna</i>	Water flea	LC ₅₀	MOR	72 hr	915	Dowden and Bennett (1965)	M	3,494,000 ug/L
		<i>Daphnia magna</i>	Water flea	LC ₅₀	MOR	96 hr	915	Dowden and Bennett (1965)	M	1,471,000 ug/L
	g. A family in a phylum other than Arthropod or Chordata (e.g. Rotifera, Annelida, Mollusca)	<i>Lymnaea sp.</i>	Pond snail	LC ₅₀	MOR	24 hr	915	Dowden and Bennett (1965)	M	10,700,000 ug/L
		<i>Lymnaea sp.</i>	Pond snail	LC ₅₀	MOR	48 hr	915	Dowden and Bennett (1965)	M	9,122,000 ug/L
		<i>Lymnaea sp.</i>	Pond snail	LC ₅₀	MOR	72 hr	915	Dowden and Bennett (1965)	M	8,828,000 ug/L
		<i>Lymnaea sp.</i>	Pond snail	LC ₅₀ **	MOR	96 hr	915	Dowden and Bennett (1965)	M	8,828,000 ug/L

Notes:

1. Data listed in this table are freshwater results with a Document Code of "C" or "M" and Endpoint Codes not "NR".

2. Abbreviation/codes are as reported in ECOTOX (USEPA, 2006; <http://cfpub.epa.gov/ecotox/>).

3. Highlighted rows indicate data that met the USEPA AWQC Guidelines (Stephan et al., 1985) for calculation of the GMAV and Final Acute Value (FAV).

4. * -Based on test species and duration requirements, the 48-hr LC50 for *Daphnia magna* appears to meet the USEPA AWQC Guidelines (Stephan et al., 1985) for use in the calculation of GMAV and/or FAV. However, after obtaining the original article which is over 40 years old, AMEC considers this result inappropriate for AWQC derivation based on the following reasons: questionable test organisms (age unclear, required to be less than 24 hours old at test inception), media (lakewater as control water) and feeding regimens (daphnids appear to have been fed, which is not recommended in Stephan et al (1985)). These testing methods would not meet current USEPA or ASTM bioassay protocols for Standard Toxicity Testing if they were conducted present day. See text for further discussion.

5. ** -Based on test species and duration requirements, the 96-hr LC50 for the pond snail appears to meet the USEPA AWQC Guidelines (Stephan et al., 1985) for use in the calculation of GMAV and/or FAV. However, after obtaining the original article which is over 40 years old, AMEC considers this result inappropriate for AWQC derivation based on the following reasons: questionable test organisms of unidentified species and collected from local waterbodies (not laboratory born) and media (lakewater as control water). These testing methods would not meet current USEPA or ASTM bioassay protocols for Standard Toxicity Testing if they were conducted present day. See text for further discussion.

Table 4
Chemical and Species/Test type Matrix for Range-Finding
and Definitive Test Series

Species & Test Type	Chemical Tested			
	m-BDSA	BSA	p-PSA	Resorcinol
<i>Ceriodaphnia dubia</i> (water flea) Acute Exposure	X	X	X	
<i>Ceriodaphnia dubia</i> (water flea) Chronic Exposure	X	X	X	
<i>Pimephales promelas</i> (fathead minnow) Acute Exposure	X	X	X	
<i>Hyalella azteca</i> (amphipod) Acute Exposure	X	X	X	
<i>Chironomus tentans</i> (midge) Acute Exposure	X	X	X	X
<i>Chironomus tentans</i> (midge) Chronic Exposure (definitive only)	X	X	X	X
<i>Oncorhynchus mykiss</i> (rainbow trout) Acute Exposure	X	X	X	
<i>Lepomis macrochirus</i> (bluegill) Acute Exposure	X	X	X	
<i>Brachionus calyciflorus</i> (rotifer) Acute Exposure	X	X	X	
<i>Brachionus calyciflorus</i> (rotifer) Chronic Exposure	X	X	X	
<i>Culex pipiens</i> (mosquito) Acute Exposure	X	X	X	

Table 5
Summary of the Nominal Concentrations Used for Reference
Toxicant Testing - Copper (II) Chloride and Potassium
Dichromate

Species & Test Type	Test Concentrations and Toxicant
<i>Ceriodaphnia dubia</i> - Acute Exposure	0, 3.125, 6.25, 12.5, 25, and 50 µg/L Copper
<i>Ceriodaphnia dubia</i> - Chronic Exposure	0, 12.5, 25, 50, 100, and 200 µg/L Copper
<i>Pimephales promelas</i> - Acute Exposure	0, 15, 30, 60, 120, and 240 µg/L Copper
<i>Hyalella azteca</i> - Acute Exposure	0, 100, 200, 400, 800, and 1,600 µg/L Copper
<i>Chironomus tentans</i> - Acute Exposure	0, 187.5, 375, 750, 1,500, and 3,000 µg/L Copper
<i>Brachionus calyciflorus</i> - Acute Exposure	0, 2.5, 5.0, 10, 20, and 40 mg/L Potassium Dichromate
<i>Brachionus calyciflorus</i> - Chronic Exposure	0, 1.25, 2.5, 5.0, 10, and 20 mg/L Potassium Dichromate

Table 6
Summary LC₅₀ and EC₅₀ reported in mg/L

Species/Procedure	m-BDSA	BSA	p-PSA	Resorcinol
Range-finding Assays				
Acute <i>Ceriodaphnia</i>	>1,000	>1,000	>1,000	NT
Chronic <i>Ceriodaphnia</i> Survival	>1,000	>1,000	>1,000	NT
Chronic <i>Ceriodaphnia</i> Reproduction	>1,000	>1,000	>1,000	NT
Acute <i>Pimephales</i>	>1,000	>1,000	>1,000	NT
Acute <i>Hyalella</i>	>1,000	>1,000	>1,000	NT
Acute <i>Chironomus</i>	>1,000	>1,000	>1,000	86.7
Acute <i>Oncorhynchus</i>	>10,000	>10,000	>10,000	NT
Acute <i>Lepomis</i>	>10,000	>10,000	>10,000	NT
Acute <i>Brachionus</i>	5190	>10,000	>10,000	NT
Acute <i>Culex</i>	NT	NT	NT	NT
Definitive Assays				
Acute <i>Ceriodaphnia</i>	6,884	4,984	7,497	NT
Chronic <i>Ceriodaphnia</i> Survival	3,474	5,238	5,278	NT
Chronic <i>Ceriodaphnia</i> Reproduction	3,436	3,078	1,027	NT
Acute <i>Pimephales</i>	>10,000	>10,000	>10,000	NT
Acute <i>Hyalella</i>	>10,000	>10,000	>10,000	NT
Acute <i>Chironomus</i>	>10,000	>10,000	>10,000	147
Chronic <i>Chironomus</i> Survival	NT	NT	NT	118
Chronic <i>Chironomus</i> Growth	NT	NT	NT	>100
Acute <i>Oncorhynchus</i>	>10,000	>10,000	>10,000	NT
Acute <i>Lepomis</i>	>10,000	>10,000	>10,000	NT
Acute <i>Brachionus</i>	6,598	6,950	10,175	NT
Chronic <i>Brachionus</i> Net Production	7,436	6,439	7,873	NT
Chronic <i>Brachionus</i> Population Increase	8,907	>5,000	9,869	NT
Acute <i>Culex</i>	>10,000	>10,000	>10,000	NT

Table 7
Acute and Chronic Toxicity Test Results for the Test Compounds

Tier 1 Requirements(1)	Scientific name, Common name	Endpoint	m-BDSA (mg/L)	BSA (mg/L)	p-PSA (mg/L)	Resorcinol (mg/L)
Acute Freshwater Animal						
a. The family Salmonidae in the class Osteichthyes	<i>Oncorhynchus mykiss</i> (rainbow trout)	96 hr LC ₅₀	>10,000	>10,000	>10,000	
b. One other family (preferably a commercially or recreationally important, warmwater species) in the class Osteichthyes (e.g. bluegill, channel catfish)	<i>Lepomis macrochirus</i> (bluegill)	96 hr LC ₅₀	>10,000	>10,000	>10,000	
c. A third family in the phylum Chordata (e.g. fish, amphibian)	<i>Pimephales promelas</i> (fathead minnow)	96 hr LC ₅₀	>10,000	>10,000	>10,000	
d. A planktonic crustacean (e.g. a cladoceran, copepod)	<i>Ceriodaphnia dubia</i> (water flea)	48 hr LC ₅₀	6,884	4,984	7,497	
e. A benthic crustacean (e.g. ostracod, isopod, amphipod, crayfish)	<i>Hyalella azteca</i> (amphipod)	96 hr LC ₅₀	>10,000	>10,000	>10,000	
f. An insect (e.g. mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge)	<i>Culex pipiens</i> (mosquito)	96 hr LC ₅₀	>10,000	>10,000	>10,000	
f. An insect (e.g. mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge)	<i>Chironomus tentans</i> (midge)	96 hr LC ₅₀				147
g. A family in a phylum other than Arthropod or Chordata (e.g. Rotifera, Annelida, Mollusca)	<i>Brachionus calyciflorus</i> (rotifer) (1)	24 hr LC ₅₀	6,598	6,950	10,175	
h. A family in any order of insect or any phylum not already represented	<i>Chironomus tentans</i> (midge larvae)	96 hr LC ₅₀	>10,000	>10,000	>10,000	
Freshwater Plant						
Results of at least one acceptable test with a freshwater algae or vascular plant is desirable but not required for criterion derivation. If plants are among the aquatic organisms most sensitive to the material, results of a test with a plant in another phylum (division) should also be available	<i>Selaxstrum capricornutum</i> (algae) (2)	96 hr LC ₅₀	>1,000	>1,000	>1,000	
Chronic Freshwater Animals						
b. At least one is an invertebrate	<i>Ceriodaphnia dubia</i> (water flea) (3)	7 day survival	3,474	5,238	5,278	
	<i>Ceriodaphnia dubia</i> (water flea) (3)	7 day reproduction	3,436	3,078	1,027	
b. At least one is an invertebrate	<i>Chironomus tentans</i> (midge) (4)	7 day survival				117
	<i>Chironomus tentans</i> (midge) (4)	7 day growth				>100
c. At least one species is an acutely sensitive freshwater species (the other two may be saltwater species)	<i>Brachionus calyciflorus</i> (rotifer) (5)	48 hr net production	7,436	6,439	7,873	
	<i>Brachionus calyciflorus</i> (rotifer) (5)	48 hr population increase	8,907	>5,000	9,869	

Notes:

(1) Toxicity tests for the rotifer were conducted in the AMEC Northwest Bioassay Laboratory. All other tests were conducted in the AMEC San Diego Laboratory (AMEC, 2003).

(2) Toxicity tests for the algae were conducted in the AMEC San Diego Laboratory (AMEC, 2002).

(3) The acute-to-chronic ratio for this species was 1.92 for m-BDSA, 1.62 for BSA, and 7.3 for p-PSA.

(4) The acute-to-chronic ratio for this species was 1.47 for resorcinol.

(5) The acute-to-chronic ratio for this species was 0.89 for m-BDSA, 1.08 for BSA, and 1.29 for p-PSA.

Table 8
Acute to Chronic Ratio Calculations

	m-BDSA (mg/L)	BSA (mg/L)	p-PSA (mg/L)	Resorcinol (mg/L)
<i>Ceriodaphnia dubia</i> (water flea)	1.92	1.62	7.30	
<i>Brachionus calyciflorus</i> (rotifer)	0.89	1.08	1.29	
<i>Chironomus tentans</i> (midge)				1.47
Final ACR (1)	3.2	3.4	5.10	7.81

Notes:

(1) If fewer than three acceptable experimentally determined ACRs are available, use enough assumed ACRs of 18 so that the total number of ACRs equals three.

Table 9
Ambient Water Quality Criteria Calculations

	m-BDSA (mg/L)	BSA (mg/L)	p-PSA (mg/L)	Resorcinol (mg/L)
Final Acute Value (FAV)	5,185	3,912	6,951	56
Criterion Maximum Concentration (CMC)	2,592	1,956	3,476	28
Final Acute to Chronic Ratio	3	3	5	8
Criterion Continuous Concentration (CCC)	1,620	1,151	1,363	7.18

Attachment 1 - Table A
Chronic Toxicity Test Results for Resorcinol
using *Daphnia* and *Pseudokirchneriella* spp.
(Resorcinol Task Force 2004/2006 Studies)

Scientific Name	Common Name	Type of Test	Endpoint	Effect Concentration (ug/L)
<i>Daphnia magna</i>	Water Flea	Survival	21-day NOEC	172
<i>Daphnia magna</i>	Water Flea	Survival	21-day LOEC	> 172
<i>Daphnia magna</i>	Water Flea	Survival	21-day EC ₅₀	> 172
<i>Daphnia magna</i>	Water Flea	Growth / Reproduction (# offspring released)	21-day NOEC	172
<i>Daphnia magna</i>	Water Flea	Growth / Reproduction (# offspring released)	21-day EC ₅₀	> 172
<i>Pseudokirchneriella subcapitata</i>	Green Algae	Cell Biomass	72-hr NOEC	47
<i>Pseudokirchneriella subcapitata</i>	Green Algae	Cell Biomass	72-hr EC ₅₀	> 97
<i>Pseudokirchneriella subcapitata</i>	Green Algae	Growth Rate	72-hr NOEC	97
<i>Pseudokirchneriella subcapitata</i>	Green Algae	Growth Rate	72-hr EC ₅₀	> 97

Notes:

- Results are summarized from Springborn Laboratories (2004) and Springborn Smithers Laboratories (2006). This work was published by the Resorcinol Task Force (RTF).
- None of the above concentrations were required for the calculation of GMAVs or FAVs for resorcinol for the following reasons. The RTF study exposure concentrations were set well below values used from either the USEPA ECOTOX database or those assayed for this report and none of the concentrations showed a significant dose-response related adverse effect on any of the test organisms. That is, most effect concentrations are unbounded NOECs in that the true NOECs may exist at much higher concentrations that were tested. See text for further discussion.

Appendix A

Bioassay Survival and LC₅₀/EC₅₀ Summaries

Range-finding Study

Benzene Metadisulfonic Acid (BMDSA)

**Appendix Table A-1. Survival, Reproduction (*Ceriodaphnia dubia*),
and LC50 Summary
Benzene Metadisulfonic Acid (BMDSA)**

Species & Test Type	Concentration (mg/L)	Mean Percent Survival	Mean Number of Neonates ^b	LC50/EC50 %Effluent ^a
<i>Ceriodaphnia dubia</i> - Acute Exposure	Lab Control	86.7	NA	>1000
	0.1	93.3	NA	
	1	100	NA	
	10	80	NA	
	100	80	NA	
	1,000	93.3	NA	
<i>Ceriodaphnia dubia</i> - Chronic Exposure	Lab Control	80	14	>1000 (survival) >1000 (repro)
	0.1	100	20	
	1	100	13	
	10	80	17	
	100	100	16	
	1,000	80	21	
<i>Pimephales promelas</i> - Acute Exposure	Lab Control	100	NA	>1000
	0.1	100	NA	
	1	100	NA	
	10	100	NA	
	100	100	NA	
	1,000	100	NA	
<i>Hyalella azteca</i> - Acute Exposure	Lab Control	93.3	NA	>1000
	0.1	93.3	NA	
	1	100	NA	
	10	93.3	NA	
	100	100	NA	
	1,000	90	NA	
<i>Chironomus tentans</i> - Acute Exposure	Lab Control	70 ^c	NA	>1000
	0.1	73	NA	
	1	46.7	NA	
	10	50	NA	
	100	63.3	NA	
	1,000	63.3	NA	
<i>Oncorhynchus mykiss</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	100	NA	
	5,000	100	NA	
<i>Lepomis macrochirus</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	100	NA	
	5,000	100	NA	
<i>Brachionus calyciflorus</i> - Acute Exposure	Lab Control	100	NA	5190
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	100	NA	
	5,000	53 [*]	NA	
	10,000	7 [*]	NA	

^a 95% confidence intervals for LC50 values are displayed in parentheses when calculation was possible.

^b Values are for *Ceriodaphnia dubia* chronic exposures only.

^c Control data were obtained from the PSA bioassay. Control performance for other three tests was below test acceptability criteria.

^{*} Statistically different from control ($p < 0.05$)

NA = Not Applicable

Benzene Monosulfonic Acid (BMSA)

**Appendix Table A-2. Survival, Reproduction (*Ceriodaphnia dubia*),
and LC50 Summary**

Benzene Monosulfonic Acid (BMSA)

Species & Test Type	Concentration (mg/L)	Mean Percent Survival	Mean Number of Neonates ^b	LC50/EC50 %Effluent ^a
<i>Ceriodaphnia dubia</i> - Acute Exposure	Lab Control	86.7	NA	>1000
	0.1	100	NA	
	1	93.3	NA	
	10	100	NA	
	100	100	NA	
	1,000	80	NA	
<i>Ceriodaphnia dubia</i> - Chronic Exposure	Lab Control	100	29	>1000 (survival) >1000 (repro)
	0.1	80	23	
	1	80	21	
	10	100	22	
	100	100	23	
	1,000	100	23	
<i>Pimephales promelas</i> - Acute Exposure	Lab Control	100	NA	>1000
	0.1	100	NA	
	1	100	NA	
	10	100	NA	
	100	100	NA	
	1,000	100	NA	
<i>Hyalella azteca</i> - Acute Exposure	Lab Control	93.3	NA	>1000
	0.1	96.7	NA	
	1	100	NA	
	10	90	NA	
	100	96.7	NA	
	1,000	93.3	NA	
<i>Chironomus tentans</i> - Acute Exposure	Lab Control	70 ^c	NA	>1000
	0.1	48.7	NA	
	1	50	NA	
	10	63.3	NA	
	100	60	NA	
	1,000	53.3	NA	
<i>Oncorhynchus mykiss</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	100	NA	
	5,000	100	NA	
<i>Lepomis macrochirus</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	100	NA	
	5,000	100	NA	
<i>Brachionus calyciflorus</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	100	NA	
	5,000	93	NA	
	10,000	53 [*]	NA	

^a 95% confidence intervals for LC50 values are displayed in parentheses when calculation was possible.

^b Values are for *Ceriodaphnia dubia* chronic exposures only.

^c Control data were obtained from the PSA bioassay. Control performance for other three tests was below test acceptability criteria.

^{*} Statistically different from control (p < 0.05)

NA = Not Applicable

p-Phenol Sulfonic Acid (PSA)

**Appendix Table A-3. Survival, Reproduction (*Ceriodaphnia dubia*),
and LC50 Summary
p-Phenol Sulfonic Acid (PSA)**

Species & Test Type	Concentration (mg/L)	Mean Percent Survival	Mean Number of Neonates ^b	LC50/EC50 %Effluent ^a
<i>Ceriodaphnia dubia</i> - Acute Exposure	Lab Control	93.3	NA	>1000
	0.1	100	NA	
	1	100	NA	
	10	100	NA	
	100	73.3	NA	
	1,000	86.7	NA	
<i>Ceriodaphnia dubia</i> - Chronic Exposure	Lab Control	100	20	>1000 (survival) >1000 (repro)
	0.1	80	19	
	1	60	18	
	10	80	22	
	100	100	24	
	1,000	100	14	
<i>Pimephales promelas</i> - Acute Exposure	Lab Control	100	NA	>1000
	0.1	90	NA	
	1	100	NA	
	10	100	NA	
	100	100	NA	
	1,000	100	NA	
<i>Hyalella azteca</i> - Acute Exposure	Lab Control	96.7	NA	>1000
	0.1	100	NA	
	1	100	NA	
	10	96.7	NA	
	100	96.7	NA	
	1,000	96.7	NA	
<i>Chironomus tentans</i> - Acute Exposure	Lab Control	70	NA	>1000
	0.1	53.3	NA	
	1	26.7	NA	
	10	50	NA	
	100	43.3	NA	
	1,000	46.7	NA	
<i>Oncorhynchus mykiss</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	100	NA	
	5,000	100	NA	
<i>Lepomis macrochirus</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	100	NA	
	5,000	100	NA	
<i>Brachionus calyciflorus</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	100	NA	
	5,000	100	NA	
	10,000	87*	NA	

^a 95% confidence intervals for LC50 values are displayed in parentheses when calculation was possible.

^b Values are for *Ceriodaphnia dubia* chronic exposures only.

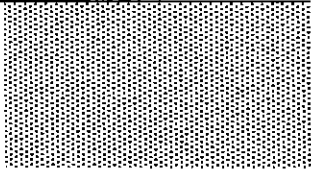
* Statistically different from control (p < 0.05)

NA = Not Applicable

Resorcinol (RES)

Appendix Table A-4. Survival, Growth, and LC50 Summary

Resorcinol (RES)

Species & Test Type	Concentration (mg/L)	Mean Percent Survival	LC50 %Effluent ^a
<i>Chironomus tentans</i> - Acute Exposure	Lab Control ^b	70	
	0.1	63.3	
	1	73.3	
	10	56.7	
	100	43.3	
	1,000	0*	86.7 (49.8-151)

^a 95% confidence intervals for LC50 values are displayed in parentheses when calculation was possible.

^b Control data were obtained from the PSA bioassay. Control performance for other three tests was below test acceptability criteria.

* Statistically different from control ($p < 0.05$)

Definitive Study

Benzene Metadisulfonic Acid (BMDSA)

**Appendix Table A-5. Survival, Reproduction (*Ceriodaphnia dubia*), and
LC50 Summary**

Benzene Metadisulfonic Acid (BMDSA)

Species & Test Type	Concentration (mg/L)	Mean Percent Survival	Mean Number of Neonates ^b / Organisms ^c	LC ₅₀ /EC ₅₀ /IC ₅₀ %Effluent ^a
<i>Ceriodaphnia dubia</i> - Acute Exposure	Lab Control	100	NA	6880 (5810-7840)
	500	100	NA	
	1,000	100	NA	
	2,000	100	NA	
	4,000	95	NA	
	8,000	35*	NA	
	10,000	10*	NA	
<i>Ceriodaphnia dubia</i> - Chronic Exposure	Lab Control	90	35	3470 (2010-4790) surv 3440 (3060-3760) repro
	500	100	39	
	1,000	100	38	
	2,000	56	32	
	4,000	70	12*	
	8,000	0*	0*	
	10,000	0*	0*	
<i>Pimephales promelas</i> - Acute Exposure	Lab Control	97.5	NA	>10,000
	500	100	NA	
	1,000	95	NA	
	2,000	97.5	NA	
	4,000	100	NA	
	8,000	97.5	NA	
	10,000	100	NA	
<i>Hyalella azteca</i> - Acute Exposure	Lab Control	98	NA	>10,000
	500	96	NA	
	1,000	100	NA	
	2,000	100	NA	
	4,000	100	NA	
	8,000	98	NA	
	10,000	92	NA	
<i>Chironomus tentans</i> - Acute Exposure	Lab Control	80	NA	>10,000
	500	78	NA	
	1,000	86	NA	
	2,000	94	NA	
	4,000	90	NA	
	8,000	86	NA	
	10,000	84	NA	

^a 95% confidence intervals for LC50 values are displayed in parentheses when calculation was possible.

^b Values are for *Ceriodaphnia dubia* chronic exposures only.

^c Values are for *Brachionus calyciflorus* chronic exposures only

* Statistically different from control (p < 0.05)

NA = Not Applicable

Appendix Table A-5 (cont.). Survival, Reproduction (*Ceriodaphnia dubia*), and LC50 Summary

Benzene Metadisulfonic Acid (BMDSA)

Species & Test Type	Concentration (mg/L)	Mean Percent Survival	Mean Number of Neonates ^b / Organisms ^c	LC50/EC50/LC50 %Effluent ^a
<i>Oncorhynchus mykiss</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	100	NA	
	5,000	100	NA	
	10,000	100	NA	
<i>Lepomis macrochirus</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	100	NA	
	5,000	100	NA	
	10,000	100	NA	
<i>Culex pipiens</i> - Acute Exposure	Lab Control	96	NA	>10,000
	10	92	NA	
	100	96	NA	
	500	96	NA	
	1,000	96	NA	
	5,000	100	NA	
	10,000	100	NA	
<i>Brachionus calyciflorus</i> - Acute Exposure	Lab Control	100	NA	6598
	625	100	NA	
	1,250	100	NA	
	2,500	100	NA	
	5,000	90	NA	
	10,000	0*	NA	
<i>Brachionus calyciflorus</i> - Chronic Exposure	Lab Control	NA	4.7 (0.87) ^d	7436 (6855-8078) prod 8907 r value
	625	NA	6.1 (0.98) ^d	
	1,250	NA	4.0 (0.85) ^d	
	2,500	NA	4.8 (0.85) ^d	
	5,000	NA	5.4 (0.92) ^d	
	10,000	NA	0.6* (0.35*) ^d	

^a 95% confidence intervals for LC50 values are displayed in parentheses when calculation was possible.

^b Values are for *Ceriodaphnia dubia* chronic exposures only.

^c Values are for *Brachionus calyciflorus* chronic exposures only

^d Number in parenthesis is the r-value

* Statistically different from control (p < 0.05)

NA = Not Applicable

Benzene Monosulfonic Acid (BMSA)

**Appendix Table A-6. Survival, Reproduction (*Ceriodaphnia dubia*), and
LC50 Summary
Benzene Monosulfonic Acid (BMSA)**

Species & Test Type	Concentration (mg/L)	Mean Percent Survival	Mean Number of Neonates ^b / Organisms ^c	LC50/EC50/IC50 %Effluent ^a
<i>Ceriodaphnia dubia</i> - Acute Exposure	Lab Control	100	NA	4980
	500	95	NA	
	1,000	100	NA	
	2,000	100	NA	
	4,000	100	NA	
	8,000	5*	NA	
	10,000	0*	NA	
<i>Ceriodaphnia dubia</i> - Chronic Exposure	Lab Control	100	38	5240 (4530-6060) surv 3080 (2710-3500) repro
	500	100	37	
	1,000	100	34	
	2,000	100	31*	
	4,000	89	12*	
	8,000	0*	0*	
	10,000	0*	0*	
<i>Pimephales promelas</i> - Acute Exposure	Lab Control	97.5	NA	>10,000
	500	100	NA	
	1,000	100	NA	
	2,000	97.5	NA	
	4,000	100	NA	
	8,000	97.5	NA	
	10,000	97.5	NA	
<i>Hyalella azteca</i> - Acute Exposure	Lab Control	98	NA	>10,000
	500	100	NA	
	1,000	100	NA	
	2,000	100	NA	
	4,000	96	NA	
	8,000	98	NA	
	10,000	82	NA	
<i>Chironomus tentans</i> - Acute Exposure	Lab Control	80	NA	>10,000
	500	84	NA	
	1,000	86	NA	
	2,000	82	NA	
	4,000	90	NA	
	8,000	90	NA	
	10,000	84	NA	

^a 95% confidence intervals for LC50 values are displayed in parentheses when calculation was possible.

^b Values are for *Ceriodaphnia dubia* chronic exposures only.

^c Values are for *Brachionus calyciflorus* chronic exposures only

* Statistically different from control (p < 0.05)

NA = Not Applicable

Appendix Table A-6 (cont.). Survival, Reproduction (*Ceriodaphnia dubia*), and LC50 Summary

Benzene Monosulfonic Acid (BMSA)

Species & Test Type	Concentration (mg/L)	Mean Percent Survival	Mean Number of Neonates ^b / Organisms ^c	LC50/EC50/IC50 %Effluent ^a
<i>Oncorhynchus mykiss</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	90	NA	
	5,000	75 ^e	NA	
	10,000	100	NA	
<i>Lepomis macrochirus</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	100	NA	
	5,000	100	NA	
	10,000	100	NA	
<i>Culex pipiens</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	92	NA	
	100	100	NA	
	500	100	NA	
	1,000	92	NA	
	5,000	88	NA	
	10,000	92	NA	
<i>Brachionus calyciflorus</i> - Acute Exposure	Lab Control	100	NA	6950
	625	100	NA	
	1,250	100	NA	
	2,500	98	NA	
	5,000	100	NA	
	10,000	0 [*]	NA	
<i>Brachionus calyciflorus</i> - Chronic Exposure	Lab Control	NA	5.9 (0.95) ^d	6439 (5416-7059) prod >5,000 r value
	625	NA	4.8 (0.87) ^d	
	1,250	NA	4.9 (0.86) ^d	
	2,500	NA	4.5 (0.90) ^d	
	5,000	NA	4.1 (0.81*) ^d	
	10,000	NA	0 ^{ef}	

^a 95% confidence intervals for LC50 values are displayed in parentheses when calculation was possible.

^b Values are for *Ceriodaphnia dubia* chronic exposures only.

^c Values are for *Brachionus calyciflorus* chronic exposures only

^d Number in parenthesis is the r-value

^e One replicate had zero percent survival, remaining three had 100% survival

^f r value incalculable due to 100% mortality

* Statistically different from control (p < 0.05)

NA = Not Applicable

p-Phenol Sulfonic Acid (PSA)

**Appendix Table A-7. Survival, Reproduction (*Ceriodaphnia dubia*), and
LC50 Summary
p-Phenol Sulfonic Acid (PSA)**

Species & Test Type	Concentration (mg/L)	Mean Percent Survival	Mean Number of Neonates ^b / Organisms ^c	LC50/EC50/IC50 %Effluent ^a
<i>Ceriodaphnia dubia</i> - Acute Exposure	Lab Control	100	NA	7500
	500	95	NA	
	1,000	100	NA	
	2,000	95	NA	
	4,000	95	NA	
	8,000	60*	NA	
	10,000	10*	NA	
<i>Ceriodaphnia dubia</i> - Chronic Exposure	Lab Control	100	37	5280 (4630-6020) surv 1030 repro
	500	100	37	
	1,000	100	20*	
	2,000	100	0*	
	4,000	90	0*	
	8,000	0*	0*	
	10,000	0*	0*	
<i>Pimephales promelas</i> - Acute Exposure	Lab Control	95	NA	>10,000
	500	97.5	NA	
	1,000	100	NA	
	2,000	97.5	NA	
	4,000	97.5	NA	
	8,000	92.5	NA	
	10,000	92.5	NA	
<i>Hyaella azteca</i> - Acute Exposure	Lab Control	98	NA	>10,000
	500	96	NA	
	1,000	98	NA	
	2,000	98	NA	
	4,000	98	NA	
	8,000	94	NA	
	10,000	64	NA	
<i>Chironomus tentans</i> - Acute Exposure	Lab Control	80	NA	>10,000
	500	94	NA	
	1,000	86	NA	
	2,000	72	NA	
	4,000	72	NA	
	8,000	82	NA	
	10,000	82	NA	

^a 95% confidence intervals for LC50 values are displayed in parentheses when calculation was possible.

^b Values are for *Ceriodaphnia dubia* chronic exposures only.

^c Values are for *Brachionus calyciflorus* chronic exposures only

* Statistically different from control (p < 0.05)

NA = Not Applicable

Appendix Table A-7 (cont.). Survival, Reproduction (*Ceriodaphnia dubia*), and LC50 Summary
p-Phenol Sulfonic Acid (PSA)

Species & Test Type	Concentration (mg/L)	Mean Percent Survival	Mean Number of Neonates ^b / Organisms ^c	LC50/EC50/IC50 %Effluent ^a
<i>Oncorhynchus mykiss</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	100	NA	
	5,000	100	NA	
	10,000	100	NA	
<i>Lepomis macrochirus</i> - Acute Exposure	Lab Control	100	NA	>10,000
	10	100	NA	
	100	100	NA	
	500	100	NA	
	1,000	100	NA	
	5,000	100	NA	
	10,000	100	NA	
<i>Culex pipiens</i> - Acute Exposure	Lab Control	84	NA	>10,000
	10	80	NA	
	100	100	NA	
	500	92	NA	
	1,000	92	NA	
	5,000	96	NA	
	10,000	100	NA	
<i>Brachionus calyciflorus</i> - Acute Exposure	Lab Control	100	NA	10,175
	1,250	100	NA	
	2,500	100	NA	
	5,000	100	NA	
	10,000	53*	NA	
	20,000	0*	NA	
<i>Brachionus calyciflorus</i> - Chronic Exposure	Lab Control	84	4.0 (0.78) ^d	7873 (7285-8367) prod 9869 r value
	1,250	80	4.4 (0.77) ^d	
	2,500	100	5.2 (0.93) ^d	
	5,000	92	5.6 (0.92) ^d	
	10,000	92	0.6* (0.41) ^d	
	20,000	96	0* ^e	

^a 95% confidence intervals for LC50 values are displayed in parentheses when calculation was possible.

^b Values are for *Ceriodaphnia dubia* chronic exposures only.

^c Values are for *Brachionus calyciflorus* chronic exposures only

^d Number in parenthesis is the r-value

^e r value incalculable due to 100% mortality

* Statistically different from control (p < 0.05)

NA = Not Applicable

Resorcinol (RES)

Appendix Table A-8. Survival, Growth, and LC50 Summary

Resorcinol (RES)

Species & Test Type	Concentration (mg/L)	Mean Percent Survival	Mean Growth per Organism ^b (mg)	LC ₅₀ /EC ₅₀ %Effluent ^a
<i>Chironomus tentans</i> - Acute Exposure	Lab Control	80	NA	147 (111-178)
	100	66	NA	
	250	8*	NA	
	500	0*	NA	
	750	0*	NA	
	1,000	0*	NA	
	2,000	0*	NA	
<i>Chironomus tentans</i> - Chronic Exposure	Lab Control	72	0.178	118 (69-202) surv >100 growth
	100	44	0.162	
	250	0*	0*	
	500	0*	0*	
	750	0*	0*	
	1,000	0*	0*	
	2,000	0*	0*	

^a 95% confidence intervals for LC50 values are displayed in parentheses when calculation was possible.

^b Values are for *C. tentans* chronic exposure only.

* Statistically different from control ($p < 0.05$)

Appendix B
Bioassay Water Quality, Survival, and Statistical Summaries
Range-finding Study

Ceriodaphnia dubia

Acute Exposure

Freshwater Acute

48 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Beazer
 Sample ID: BMDSA
 Contact: _____
 Test #: 0211-835

Start Date & Time: 11/27/02 14:30
 End Date & Time: 11/29/02 1340
 Test Organism: C. dubia
 Test Protocol: EPA WFT 1994, EPA OPPTS 1796

Concentration mg/L	Rep	Number of Live Organisms			Dissolved Oxygen (mg/L)			pH (pH units)			Conductivity (µmhos-cm)			Temperature (°C)			Percent Survival
		0	24	48	0	24	48	0	24	48	0	24	48	0	24	48	
Lab Control	A	5	5	4	8.0	-	8.5	8.05	-	8.19	182	-	189	24.7	24.3	24.6	80
	B	5	4	4													80
	C	5	5	5													100
0.1	A	5	5	4	7.9	-	8.5	8.03	-	8.19	179	-	190	24.7	24.3	24.6	80
	B	5	5	5													100
	C	5	5	5													100
1.0	A	5	5	5	7.9	-	8.5	8.02	-	8.23	180	-	188	24.7	24.3	24.6	100
	B	5	5	5													100
	C	5	5	5													100
10	A	5	5	3	7.8	-	8.5	8.03	-	8.23	184	-	189	24.7	24.3	24.6	60
	B	5	5	5													100
	C	5	5	4													80
100	A	5	5	5	7.8	-	8.5	8.08	-	8.24	238	-	228	24.7	24.3	24.6	100
	B	5	5	2													40
	C	5	5	5													100
1000	A	5	5	5	8.0	-	8.6	8.15	-	8.25	741	-	581	24.7	24.3	24.6	100
	B	5	5	5													100
	C	5	4	4													80
Technician Initials		AH BL SL															

Animal Source: InternalDate Received: NA

Comments: 0 hrs: range finder test, fed prior to initiation
 24 hrs: _____
 48 hrs: _____

QA Check: Bcs 12/02/02Final Review: 4/11/03

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

Daphnia Acute Survival Bioassay-48 Hr Survival

Start Date: 11/27/2002 Test ID: 0211-335 Sample ID: BEAZER
 End Date: 11/29/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: BMDSA - Benzene Metadisulfonic Acid
 Sample Date: Protocol: EPAA 93-EPA Acute Test Species: CD-Ceriodaphnia dubia
 Comments: Industrial product testing

Conc-mg/L	1	2	3
L-Lab Control	0.8000	0.8000	1.0000
0.1	0.8000	1.0000	1.0000
1	1.0000	1.0000	1.0000
10	0.6000	1.0000	0.8000
100	1.0000	0.4000	1.0000
1000	1.0000	1.0000	0.8000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
L-Lab Control	0.8667	1.0000	1.1865	1.1071	1.3453	11.587	3				0.9333	1.0000
0.1	0.9333	1.0769	1.2659	1.1071	1.3453	10.861	3	-0.472	2.500	0.4207	0.9333	1.0000
1	1.0000	1.1538	1.3453	1.3453	1.3453	0.000	3	-0.943	2.500	0.4207	0.9333	1.0000
10	0.8000	0.9231	1.1128	0.8861	1.3453	20.637	3	0.438	2.500	0.4207	0.8444	0.9048
100	0.8000	0.9231	1.1251	0.6847	1.3453	33.897	3	0.365	2.500	0.4207	0.8444	0.9048
1000	0.9333	1.0769	1.2659	1.1071	1.3453	10.861	3	-0.472	2.500	0.4207	0.8444	0.9048

Auxiliary Tests

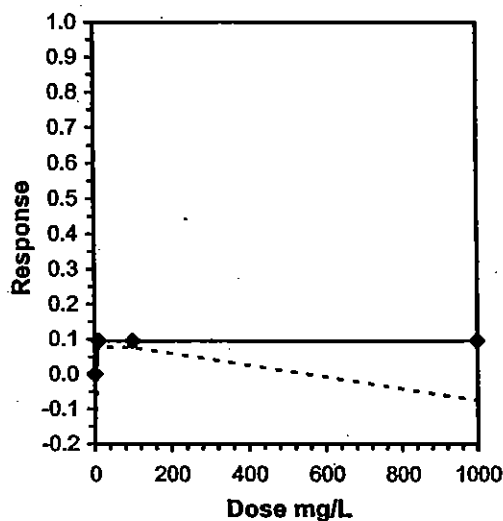
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)

Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	1000	>1000			0.37906	0.44104	0.02488	0.04248	0.71117	5, 12

Linear Interpolation (200 Resamples)

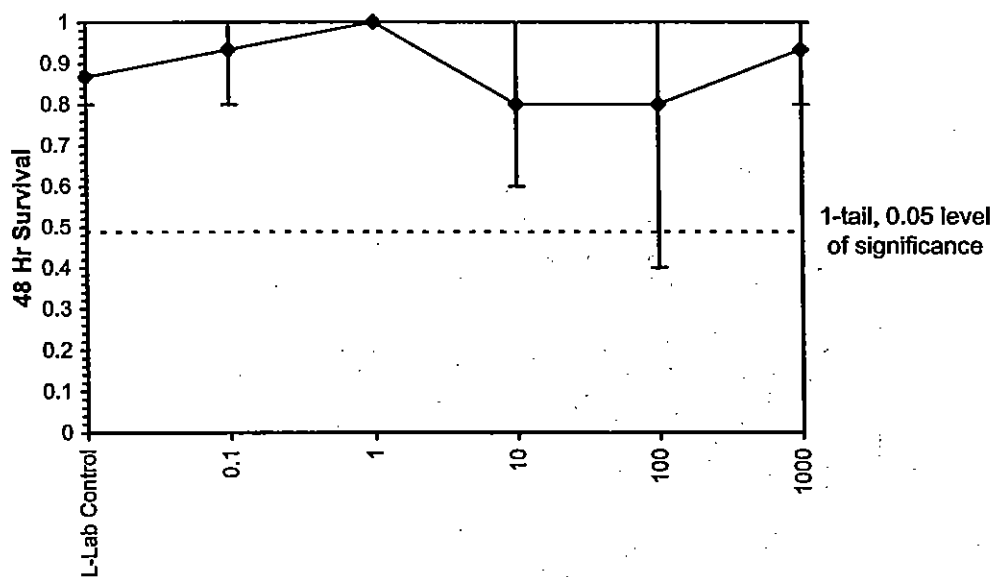
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	5.7250			
IC10	>1000			
IC15	>1000			
IC20	>1000			
IC25	>1000			
IC40	>1000			
IC50	>1000			



Daphnia Acute Survival Bioassay-48 Hr Survival

Start Date: 11/27/2002	Test ID: 0211-335	Sample ID: BEAZER
End Date: 11/29/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: BMDSA - Benzene Metadisulfonic Acid
Sample Date:	Protocol: EPAA 93-EPA Acute	Test Species: CD-Ceriodaphnia dubia
Comments: Industrial product testing		

Dose-Response Plot



Freshwater Acute

48 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Beazer
 Sample ID: BMSA
 Contact: _____
 Test #: 0211-336

Start Date & Time: 11/27/02 1430
 End Date & Time: 11/29/02 1330
 Test Organism: C. dubia
 Test Protocol: EPA WET 1994, EPA OPPTS 1996

Concentration mg/L	Rep	Number of Live Organisms			Dissolved Oxygen (mg/L)			pH (pH units)			Conductivity (µmhos-cm)			Temperature (°C)			Percent Survival
		0	24	48	0	24	48	0	24	48	0	24	48	0	24	48	
Lab Control	A	5	5	5	8.2	—	8.5	8.24	—	8.15	179	—	189	24.7	24.3	24.6	100
	B	5	5	5													100
	C	5	3	3													60
0.1 mg/L	A	5	5	5	8.2	—	8.5	8.22	—	8.21	179	—	187	24.7	24.3	24.6	100
	B	5	5	5													100
	C	5	5	5													100
1.0 mg/L	A	5	5	4	8.1	—	8.5	8.19	—	8.21	180	—	188	24.7	24.3	24.6	80
	B	5	5	5													100
	C	5	5	5													100
10 mg/L	A	5	5	5	8.1	—	8.5	8.23	—	8.20	181	—	187	24.7	24.3	24.6	100
	B	5	5	5													100
	C	5	2	5													100
100 mg/L	A	5	5	5	8.1	—	8.5	8.24	—	8.22	218	—	220	24.7	24.3	24.6	100
	B	5	5	5													100
	C	5	5	5													100
1000 mg/L	A	5	5	4	8.3	—	8.6	8.29	—	8.23	550	—	561	24.7	24.3	24.6	80
	B	5	5	4													80
	C	5	5	4													80
Technician Initials		AH	BR	SC													

Animal Source: internal Date Received: NA

Comments: 0 hrs: range finder test, fed prior to initiation
 24 hrs: _____
 48 hrs: _____

QA Check: BGS 12/02/02

Final Review: af 1/14/03

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

Daphnia Acute Survival Bioassay-48 Hr Survival

Start Date: 11/27/2002 Test ID: 0211-336 Sample ID: BEAZER
 End Date: 11/29/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: BMSA - Benzene Monosulfonic Acid
 Sample Date: Protocol: EPAA 93-EPA Acute Test Species: CD-Ceriodaphnia dubia
 Comments: Industrial product testing

Conc-mg/L	1	2	3
L-Lab Control	1.0000	1.0000	0.6000
0.1	1.0000	1.0000	1.0000
1	0.8000	1.0000	1.0000
10	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000
1000	0.8000	0.8000	0.8000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
L-Lab Control	0.8667	1.0000	1.1922	0.8861	1.3453	22.238	3				0.9600	1.0000
0.1	1.0000	1.1538	1.3453	1.3453	1.3453	0.000	3	-1.538	2.500	0.2489	0.9600	1.0000
1	0.9333	1.0769	1.2659	1.1071	1.3453	10.861	3	-0.740	2.500	0.2489	0.9600	1.0000
10	1.0000	1.1538	1.3453	1.3453	1.3453	0.000	3	-1.538	2.500	0.2489	0.9600	1.0000
100	1.0000	1.1538	1.3453	1.3453	1.3453	0.000	3	-1.538	2.500	0.2489	0.9600	1.0000
1000	0.8000	0.9231	1.1071	1.1071	1.1071	0.000	3	0.854	2.500	0.2489	0.8000	0.8333

Auxiliary Tests

Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$)

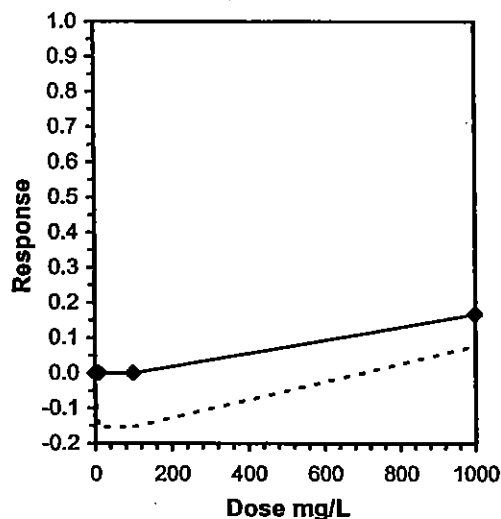
Statistic: 0.73526 Critical: 0.858 Skew: -1.5095 Kurt: 4.45404

Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	1000	>1000			0.20807	0.24099	0.02972	0.01487	0.15106	5, 12

Linear Interpolation (200 Resamples)

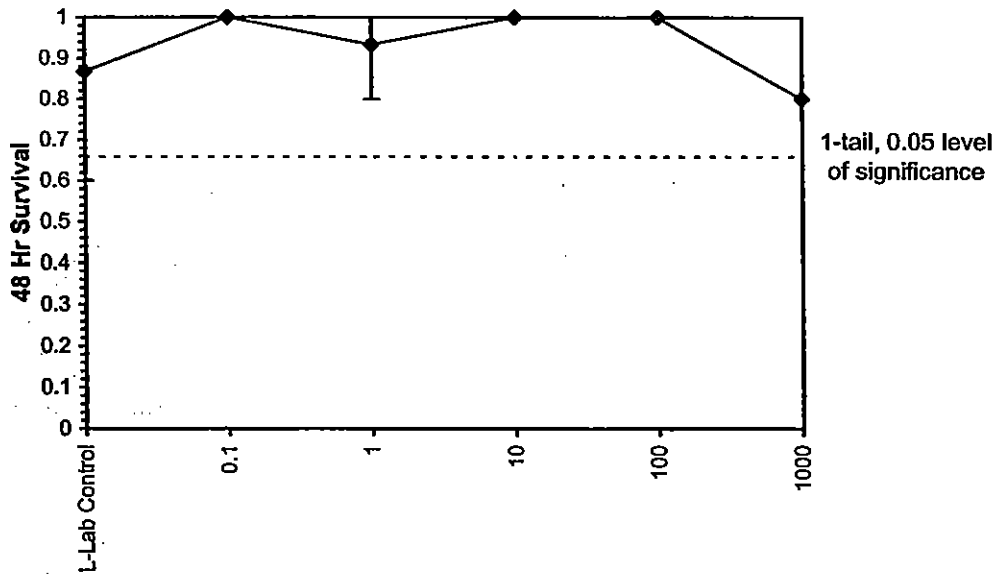
Point	mg/L	SD	95% CL(Exp)		Skew
IC05	370.00	88.19	0.00	606.25	-1.3275
IC10	640.00	112.56	181.00	1112.50	0.1248
IC15	910.00				
IC20	>1000				
IC25	>1000				
IC40	>1000				
IC50	>1000				



Daphnia Acute Survival Bioassay-48 Hr Survival

Start Date:	11/27/2002	Test ID:	0211-336	Sample ID:	BEAZER
End Date:	11/29/2002	Lab ID:	AEESD-AMEC Bioassay SD	Sample Type:	BMSA - Benzene Monosulfonic Acid
Sample Date:		Protocol:	EPAA 93-EPA Acute	Test Species:	CD-Ceriodaphnia dubia
Comments:	Industrial product testing				

Dose-Response Plot



Freshwater Acute

48 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Blaizer
 Sample ID: PSA
 Contact: _____
 Test #: D211-334

Start Date & Time: 11/27/02 14:30
 End Date & Time: 11/29/02 13:20
 Test Organism: C. dubia
 Test Protocol: EPA WET 1984, EPA OPPTS 1996

Concentration mg/L	Rep	Number of Live Organisms			Dissolved Oxygen (mg/L)			pH (pH units)			Conductivity (µmhos-cm)			Temperature (°C)			Percent Survival
		0	24	48	0	24	48	0	24	48	0	24	48	0	24	48	
lab cont.	A	5	5	4	8.1	-	8.4	8.04	-	8.17	178	-	186	24.7	24.3	24.6	80
	B	5	5	5													100
	C	5	5	5													100
0.1 mg/L	A	5	5	5	8.0	-	8.5	8.04	-	8.20	179	-	187	24.7	24.3	24.6	100
	B	5	5	5													100
	C	5	5	5													100
1.0	A	5	5	5	8.0	-	8.5	8.03	-	8.22	179	-	189	24.7	24.3	24.6	100
	B	5	5	5													100
	C	5	5	5													100
10	A	5	5	5	8.0	-	8.5	8.01	-	8.23	180	-	191	24.7	24.3	24.6	100
	B	5	5	5													100
	C	5	5	5													100
100	A	5	5	2	8.0	-	8.4	7.83	-	8.24	208	-	422	24.7	24.3	24.6	40
	B	5	5	4													80
	C	5	5	5													100
1000	A	5	5	4	8.1	-	8.5	7.43	-	8.05	454	-	455	24.7	24.3	24.6	80
	B	5	4	4													80
	C	5	5	5													100
Technician Initials		AP	BR	SC													

Animal Source: Internal Date Received: NA

Comments: 0 hrs: range finder test, fed prior to initiation
 24 hrs: _____
 48 hrs: _____

QA Check: BCS 12/02/02 Final Review: QF 1/11/03

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

Daphnia Acute Survival Bioassay-48 Hr Survival

Start Date: 11/27/2002 Test ID: 0211-334 Sample ID: BEAZER
 End Date: 11/29/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: PSA - P-Phenol Sulfonic Acid
 Sample Date: Protocol: EPAA 93-EPA Acute Test Species: CD-Ceriodaphnia dubia
 Comments: Industrial product testing

Conc-mg/L	1	2	3
L-Lab Control	0.8000	1.0000	1.0000
0.1	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000
100	0.4000	0.8000	1.0000
1000	0.8000	0.8000	1.0000

Conc-mg/L	Transform: Arcsin Square Root							1-Tailed		MSD	Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical		Mean	N-Mean
L-Lab Control	0.9333	1.0000	1.2659	1.1071	1.3453	10.861	3				0.9833	1.0000
0.1	1.0000	1.0714	1.3453	1.3453	1.3453	0.000	3	-0.615	2.500	0.3224	0.9833	1.0000
1	1.0000	1.0714	1.3453	1.3453	1.3453	0.000	3	-0.615	2.500	0.3224	0.9833	1.0000
10	1.0000	1.0714	1.3453	1.3453	1.3453	0.000	3	-0.615	2.500	0.3224	0.9833	1.0000
100	0.7333	0.7857	1.0457	0.6847	1.3453	31.991	3	1.707	2.500	0.3224	0.8000	0.8136
1000	0.8667	0.9286	1.1865	1.1071	1.3453	11.587	3	0.615	2.500	0.3224	0.8000	0.8136

Auxiliary Tests

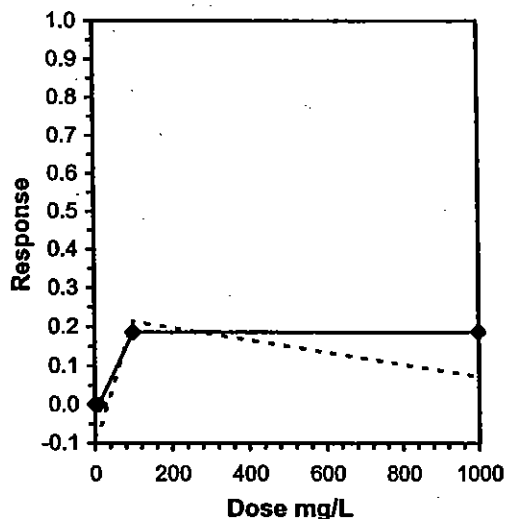
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)

Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	1000	>1000			0.25445	0.27965	0.04383	0.02495	0.19646	5, 12

Linear Interpolation (200 Resamples)

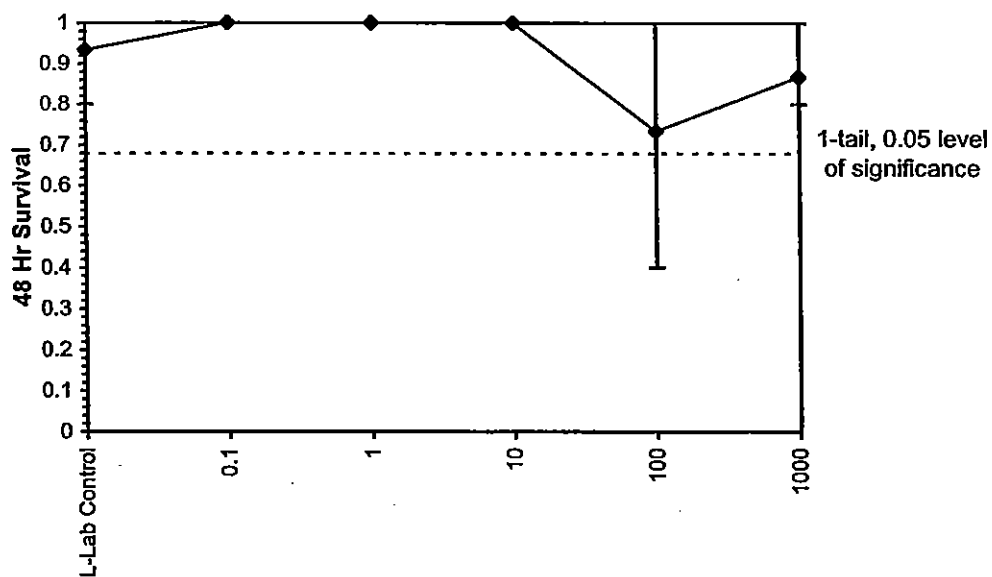
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	34.136			
IC10	58.273			
IC15	82.409			
IC20	>1000			
IC25	>1000			
IC40	>1000			
IC50	>1000			



Daphnia Acute Survival Bioassay-48 Hr Survival

Start Date: 11/27/2002 Test ID: 0211-334 Sample ID: BEAZER
End Date: 11/29/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: PSA - P-Phenol Sulfonic Acid
Sample Date: Protocol: EPAA 93-EPA Acute Test Species: CD-Ceriodaphnia dubia
Comments: Industrial product testing

Dose-Response Plot



Ceriodaphnia dubia

Chronic Exposure

Bioassay Laboratory
5550 Morehouse Dr., Suite B
San Diego, CA 92121

Client: Biazer

Sample ID: BMDSA

Seven Day Chronic Bioassay

Test Species: C. dubia

Test Date/Time: 11/27/02 14:40

Test No: 0211-349

Concentration	Lab control							
Day	0	1	2	3	4	5	6	7
pH	8.05	8.16	8.12	8.06	8.01	8.28	8.03	
DO (mg/L)	8.0	8.1	8.4	8.2	7.8	8.0	7.8	
Cond. (µmhos-cm)	182	185	178	190	177	180	160	
Temp (°C)	24.7	24.0	24.3	24.0	24.0	24.0	24.1	
pH		8.16	8.12	8.08	8.28	8.05	8.06	8.02
DO (mg/L)		8.4	8.2	8.7	8.5	8.1	8.0	8.1
Temp (°C)		24.3	24.6	24.4	24.3	24.1	24.6	24.2

Concentration	0.1 mg/L							
Day	0	1	2	3	4	5	6	7
pH	8.03	8.17	8.18	8.10	8.24	8.29	8.09	
DO (mg/L)	7.9	8.1	8.4	8.2	8.6	7.8	7.8	
Cond. (µmhos-cm)	179	179	180	192	179	181	181	
Temp (°C)	24.7	24.5	24.3	24.0	24.0	24.0	24.1	
pH		8.20	8.15	8.08	8.27	8.01	8.07	8.04
DO (mg/L)		8.8	8.4	8.4	8.6	7.9	7.8	8.0
Temp (°C)		24.3	24.6	24.4	24.3	24.1	24.6	24.2

Concentration	1.0 mg/L							
Day	0	1	2	3	4	5	6	7
pH	8.02	8.20	8.20	8.14	8.25	8.26	8.14	
DO (mg/L)	7.9	8.1	8.4	8.2	8.5	7.9	7.7	
Cond. (µmhos-cm)	180	180	180	192	179	182	182	
Temp (°C)	24.7	24.5	24.3	24.0	24.0	24.0	24.0	
pH		8.23	8.15	8.08	8.18	8.01	8.05	8.05
DO (mg/L)		8.3	8.2	8.2	8.6	7.9	8.0	7.9
Temp (°C)		24.3	24.6	24.4	24.3	24.1	24.6	24.2

Concentration	10 mg/L							
Day	0	1	2	3	4	5	6	7
pH	8.03	8.20	8.22	8.15	8.33	8.26	8.14	
DO (mg/L)	7.8	8.1	8.5	8.3	8.5	7.9	7.8	
Cond. (µmhos-cm)	184	184	189	203	182	188	184	
Temp (°C)	24.7	24.5	24.2	24.0	24.0	24.0	24.0	
pH		8.25	8.17	8.11	8.16	8.02	8.03	8.04
DO (mg/L)		8.5	8.3	8.4	8.6	7.9	7.9	7.9
Temp (°C)		24.3	24.6	24.4	24.3	24.1	24.6	24.2

Concentration	100 mg/L							
Day	0	1	2	3	4	5	6	7
pH	8.08	8.23	8.23	8.19	8.35	8.18	8.17	
DO (mg/L)	7.8	8.1	8.5	8.3	8.5	8.1	7.7	
Cond. (µmhos-cm)	238	215	234	258	236	244	235	
Temp (°C)	24.7	24.1	23.9	24.0	24.0	24.0	24.0	
pH		8.26	8.18	8.15	8.17	8.02	8.04	8.06
DO (mg/L)		8.3	8.3	8.3	8.7	8.0	7.8	7.9
Temp (°C)		24.3	24.6	24.4	24.7	24.1	24.6	24.2

Concentration	1000 mg/L							
Day	0	1	2	3	4	5	6	7
pH	8.15	8.31	8.29	8.29	8.38	8.20	8.21	
DO (mg/L)	8.0	8.3	8.8	8.5	8.8	8.4	7.9	
Cond. (µmhos-cm)	141	546	732	776	729	740	643	
Temp (°C)	24.7	26.0	23.8	24.0	24.0	24.0	24.0	
pH		8.32	8.20	8.17	8.25	8.10	8.04	8.12
DO (mg/L)		8.3	8.3	8.4	8.7	7.9	8.0	8.1
Temp (°C)		24.3	24.6	24.4	24.7	24.1	24.6	24.2

Comments:

range finder test

Animal Source:

Internal

QA Check:

4/14/03

Analysts:

af, af, sc, md

Date Received:

NA

Final Review:

4/14/03

AMEC Earth and Environmental
Bioassay Laboratory
5550 Morehouse Dr., Suite B
San Diego, CA 92121

Daphnia Survival and Reproduction Datasheet

Client/Sample ID: BIAZER 1 BMDSA

Start Date: 11/27/02

End Date: 12/4/02

Test Number: 0211-349

Start Time: 14:40

End Time: 1330

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
LC	1	0	0/2	-	-	-	-	-	-	0/2	
	2	0	0	0	4	0	0	4	-	10	4AH
	3	0	0	0	6	8	12	0	-	26	
	4	0	0	4	8	6	0	2	-	20	
	5	0	0	0	2	4	0	9	-	15	
Analyst		SH	MS	SC	AH	OG	MD	AT	SA		

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
10 mg/L	1	0	0/2	-	-	-	-	-	-	0/2	
	2	0	0	0	6	5	10	0	-	21	
	3	0	0	0	6	5	8	0	-	19	
	4	0	0	6	4	0	7	14	-	25	3AH
	5	0	0	0	4	5	9	0	-	18	

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
0.1 mg/L	1	0	0	0	3	9	12	0	-	24	
	2	0	0	0	3	6	9	0	-	18	
	3	0	0	0	2	6	8	0	-	16	
	4	0	0	0	4	0	4	0	-	8	0AH
	5	0	0	7	7	0	10	12	-	36	

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
100 mg/L	1	0	0	0	0	4	9	0	-	13	
	2	0	0	0	3	2	0	3	-	8	3AH
	3	0	0	3	1	0	0	0	-	4	
	4	0	0	6	6	0	9	15	-	36	
	5	0	0	0	4	6	9	0	-	19	

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
1.0 mg/L	1	0	0	0	3	7	0	7	-	17	
	2	0	0	0	0	0	4	0	-	4	0AH
	3	0	0	0	5	7	9	0	-	21	
	4	0	0	0	0	0	0	0	-	0	
	5	0	0	0	6	8	9	0	-	23	

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
1000 mg/L	1	0	0	5	5	0	14	0	-	24	
	2	0	0	0	6	10	12	6	-	28	
	3	0	0	5	6	0	9	14	-	34	
	4	0	0	0	8	4	8	0	-	20	0AH
	5	0	0	0/2	-	-	-	-	-	0/2	

Time Fed (day): (0) 14:40 (1) 0930 (2) 1220 (3) 1015 (4) 1515 (5) 1400 (6) 15:30 (7) 1245 (8) _____

Comments: _____

QA Check: SP 1/14/03

Final Review: SP 1/14/03

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

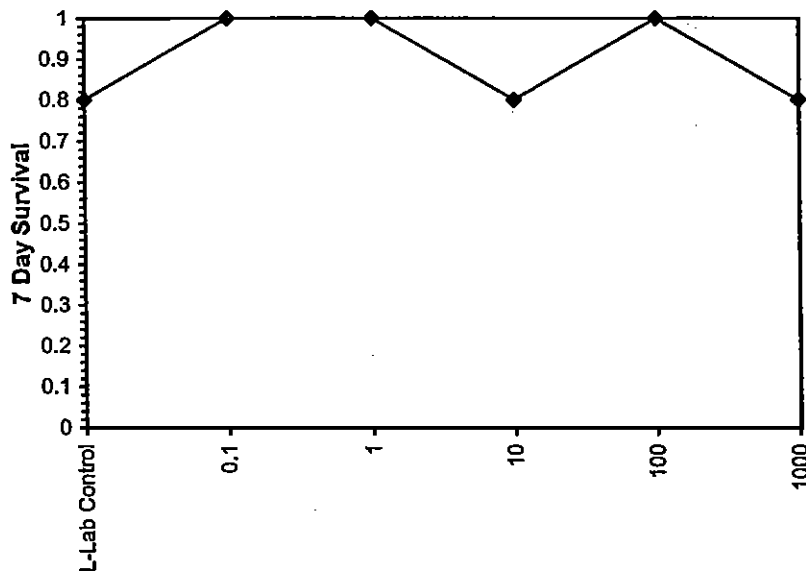
Start Date: 11/27/2002 Test ID: 0211-349 Sample ID: BEAZER
 End Date: 12/04/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: BMDSA
 Sample Date: Protocol: EPAF 94-EPA Freshwater Ct Test Species: CD-Ceriodaphnia dubia
 Comments: Industrial product testing

Conc-mg/L	1	2	3	4	5
L-Lab Control	0.0000	1.0000	1.0000	1.0000	1.0000
0.1	1.0000	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	1.0000
10	0.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000	0.0000

Conc-mg/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
L-Lab Control	0.8000	1.0000	1	4	5	5		
0.1	1.0000	1.2500	0	5	5	5	0.5000	0.0500
1	1.0000	1.2500	0	5	5	5	0.5000	0.0500
10	0.8000	1.0000	1	4	5	5	0.7778	0.0500
100	1.0000	1.2500	0	5	5	5	0.5000	0.0500
1000	0.8000	1.0000	1	4	5	5	0.7778	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	1000	>1000		

Dose-Response Plot



Ceriodaphnia Survival and Reproduction Test-Reproduction

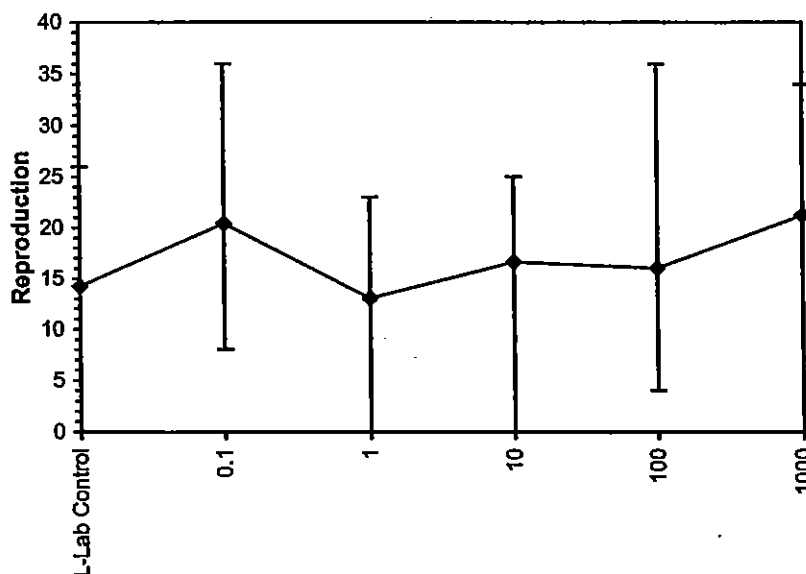
Start Date: 11/27/2002 Test ID: 0211-349 Sample ID: BEAZER
 End Date: 12/04/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: BMDSA
 Sample Date: Protocol: EPAF 94-EPA Freshwater Cf Test Species: CD-Ceriodaphnia dubia
 Comments: Industrial product testing

Conc-mg/L	1	2	3	4	5
L-Lab Control	0.000	10.000	26.000	20.000	15.000
0.1	24.000	18.000	16.000	8.000	36.000
1	17.000	4.000	21.000	0.000	23.000
10	0.000	21.000	19.000	25.000	18.000
100	13.000	8.000	4.000	36.000	19.000
1000	24.000	28.000	34.000	20.000	0.000

Conc-mg/L	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed	
			Mean	Min	Max	CV%			Critical	MSD
L-Lab Control	14.200	1.0000	14.2000	0.0000	26.0000	69.786	5			
0.1	20.400	1.4366	20.4000	8.0000	36.0000	51.131	5	-0.888	2.360	16.4806
1	13.000	0.9155	13.0000	0.0000	23.0000	79.756	5	0.172	2.360	16.4806
10	16.600	1.1690	16.6000	0.0000	25.0000	58.188	5	-0.344	2.360	16.4806
100	16.000	1.1268	16.0000	4.0000	36.0000	78.187	5	-0.258	2.360	16.4806
1000	21.200	1.4930	21.2000	0.0000	34.0000	60.993	5	-1.002	2.360	16.4806

Auxiliary Tests					Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.98161	0.9	-0.2124	-0.4548		
Bartlett's Test indicates equal variances (p = 0.99)					0.57582	15.0863				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	1000	>1000			16.4806	1.16061	54.14	121.917	0.81325	5, 24

Dose-Response Plot



Bioassay Laboratory
5550 Morehouse Dr., Suite B
San Diego, CA 92121

Client:

Blazer

Sample ID:

BMSA

Initial Fin hem es
Seven Day Chronic Bioassay

Test Species:

C. dubia

Test Date/Time:

11/27/02 14:30

Test No:

0211-350

Concentration	Lab control							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.24	8.16	8.12	8.06	8.03	8.21	8.07	
DO (mg/L)	8.2	8.2	8.3	8.2	8.5	8.0	7.9	
Cond. (µmhos-cm)	179	180	178	190	177	178	194	
Temp (°C)	24.7	24.0	24.3	24.0	24.0	24.0	24.6	
Final								
pH		8.22	8.16	8.17	8.09	8.01	8.02	8.07
DO (mg/L)		8.3	8.2	8.4	8.4	8.0	8.1	8.1
Temp (°C)		24.3	24.6	24.4	24.7	24.1	24.6	24.2

Concentration	0.1 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.22	7.97	8.23	8.05	8.28	8.17	7.99	
DO (mg/L)	8.2	8.0	8.4	8.8	8.5	8.0	7.8	
Cond. (µmhos-cm)	179	177	179	189	175	181	179	
Temp (°C)	24.7	24.3	24.3	24.0	24.0	24.0	24.1	
Final								
pH		8.25	8.16	8.20	8.4	8.03	8.05	8.08
DO (mg/L)		8.3	8.1	8.5	8.4	8.1	8.0	8.1
Temp (°C)		24.3	24.6	24.4	24.3	24.1	24.6	24.2

Concentration	1.0 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.19	8.08	8.23	8.14	8.29	8.19	7.98	
DO (mg/L)	8.1	8.0	8.5	8.2	8.6	7.9	7.7	
Cond. (µmhos-cm)	180	180	179	192	179	181	182	
Temp (°C)	24.7	24.3	24.3	24.0	24.0	24.0	24.1	
Final								
pH		8.28	8.16	8.21	8.11	8.05	8.06	8.09
DO (mg/L)		8.5	8.1	8.6	8.5	8.02	8.0	8.1
Temp (°C)		24.3	24.6	24.4	24.3	24.1	24.6	24.2

Concentration	10 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.23	8.15	8.24	8.20	8.29	8.20	8.10	
DO (mg/L)	8.7	8.0	8.5	8.2	8.6	8.1	7.8	
Cond. (µmhos-cm)	181	184	185	198	183	184	184	
Temp (°C)	24.7	24.2	24.3	24.0	24.0	24.0	24.0	
Final								
pH		8.30	8.17	8.22	8.4	8.05	8.05	8.06
DO (mg/L)		8.5	8.3	8.5	8.6	8.6	7.9	8.0
Temp (°C)		24.3	24.6	24.4	24.3	24.1	24.6	24.2

Concentration	100 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.24	8.20	8.26	8.23	8.29	8.19	8.07	
DO (mg/L)	8.1	7.9	8.5	8.2	8.6	8.0	7.7	
Cond. (µmhos-cm)	218	241	216	231	218	219	217	
Temp (°C)	24.7	24.2	24.2	24.0	24.0	24.0	24.0	
Final								
pH		8.31	8.18	8.22	8.2	8.04	8.00	8.05
DO (mg/L)		8.5	8.3	8.4	8.7	7.8	7.9	8.0
Temp (°C)		24.3	24.6	24.4	24.7	24.1	24.6	24.2

Concentration	1000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.29	8.32	8.30	8.30	8.34	8.23	8.16	
DO (mg/L)	8.3	8.1	8.8	8.3	8.9	8.2	8.0	
Cond. (µmhos-cm)	550	136	541	568	535	542	543	
Temp (°C)	24.7	24.4	24.2	24.0	24.0	24.0	24.0	
Final								
pH		8.40	8.15	8.23	8.17	8.10	8.07	8.08
DO (mg/L)		8.5	8.2	8.5	8.6	7.9	7.9	8.0
Temp (°C)		24.3	24.6	24.4	24.3	24.1	24.6	24.2

Comments:

range finder test

Animal Source:

Internal

QA Check:

df 1/14/03

Analysts:

df, SC, MD

Date Received:

NA

Final Review:

df 1/14/03

AMEC Earth and Environmental
Bioassay Laboratory
5550 Morehouse Dr., Suite B
San Diego, CA 92121

Daphnia Survival and Reproduction Datasheet

Client/Sample ID: Bea 3er / BMSA

Start Date: 11/27/02

End Date: 12/4/02

Test Number: 0211-350

Start Time: 1430

End Time: 1400

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
LC	1	0	0	0	5	9	15	✓	-	29	
	2	0	0	0	6	8	13	✓	-	27	
	3	0	0	0	6	11	15	✓	-	32	
	4	0	0	0	6	8	14	✓	-	28	
	5	0	0	0	6	6	15	✓	-	27	15
Analyst	SH	W	82	AK	DE	MD	SA				DL

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
10 mg/L	1	0	0	0	4	7	10	✓	-	21	
	2	0	0	0	6	8	14	✓	-	28	
	3	0	0	0	5	5	12	✓	-	22	
	4	0	0	0	8	7	14	✓	-	29	
	5	0	0	0	6	5	0	✓	-	11	0

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
0.1 mg/L	1	0	0	0	6	12	18	✓	-	33	
	2	0	0	0	6	6	10	✓	-	22	
	3	0	old	-	-	-	-	-	-	old	
	4	0	0	0	6	9	14	✓	-	29	
	5	0	0	0	4	13	15	✓	-	32	13

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
100 mg/L	1	0	0	0	6	8	14	✓	-	28	
	2	0	0	0	6	9	13	✓	-	28	
	3	0	0	5	0	11	20	✓	-	36	
	4	0	0	0	6	3	6	✓	-	15	
	5	0	0	0	6	4	0	✓	-	10	0

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
1.0 mg/L	1	0	0	old	-	-	-	-	-	old	
	2	0	0	0	7	4	12	✓	-	26	
	3	0	0	0	7	8	16	✓	-	31	
	4	0	0	0	6	7	8	✓	-	21	
	5	0	0	0	3	12	10	✓	-	25	11

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
1000 mg/L	1	0	0	0	4	10	14	✓	-	28	
	2	0	0	0	6	8	13	✓	-	27	
	3	0	0	6	8	0	15	✓	-	29	
	4	0	0	0	6	8	7	✓	-	21	
	5	0	0	0	6	4	0	✓	-	10	0

Time Fed (day): (0) 1430 (1) 0930 (2) 1230 (3) 1040 (4) 1505 (5) 1330 (6) 1600 (7) 1100 (8) 1400

Comments: _____

QA Check: 1/14/03

Final Review: 1/14/03

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

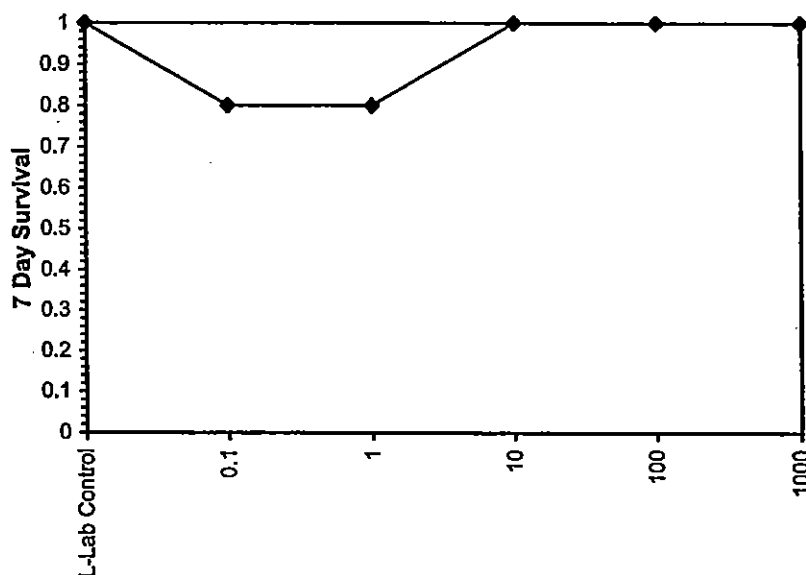
Start Date: 11/27/2002 Test ID: 0211-350 Sample ID: BEAZER
 End Date: 12/04/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: BMSA
 Sample Date: Protocol: EPAF 94-EPA Freshwater Cf Test Species: CD-Ceriodaphnia dubia
 Comments: Industrial product testing

Conc-mg/L	1	2	3	4	5
L-Lab Control	1.0000	1.0000	1.0000	1.0000	1.0000
0.1	1.0000	1.0000	0.0000	1.0000	1.0000
1	0.0000	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-mg/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
L-Lab Control	1.0000	1.0000	0	5	5	5		
0.1	0.8000	0.8000	1	4	5	5	0.5000	0.0500
1	0.8000	0.8000	1	4	5	5	0.5000	0.0500
10	1.0000	1.0000	0	5	5	5	1.0000	0.0500
100	1.0000	1.0000	0	5	5	5	1.0000	0.0500
1000	1.0000	1.0000	0	5	5	5	1.0000	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	1000	>1000		

Dose-Response Plot



Ceriodaphnia Survival and Reproduction Test-Reproduction

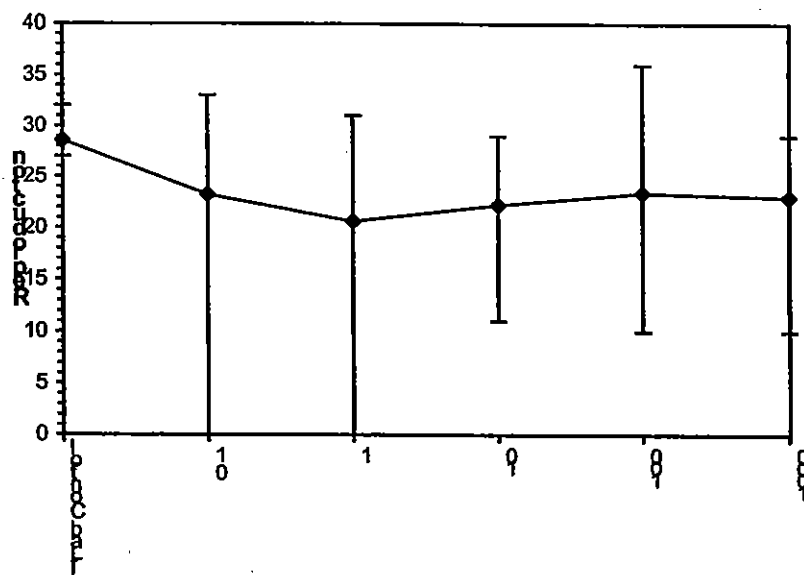
Start Date: 11/27/2002	Test ID: 0211-350	Sample ID: BEAZER
End Date: 12/04/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: BMSA
Sample Date:	Protocol: EPAF 94-EPA Freshwater Ct Test Species:	CD-Ceriodaphnia dubia
Comments: Industrial product testing		

Conc-mg/L	1	2	3	4	5
L-Lab Control	29.000	27.000	32.000	28.000	27.000
0.1	33.000	22.000	0.000	29.000	32.000
1	0.000	26.000	31.000	21.000	25.000
10	21.000	28.000	22.000	29.000	11.000
100	28.000	28.000	36.000	15.000	10.000
1000	28.000	27.000	29.000	21.000	10.000

Conc-mg/L	Mean	N-Mean	Transform: Untransformed				N	Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%			
L-Lab Control	28.600	1.0000	28.600	27.000	32.000	7.251	5		
0.1	23.200	0.8112	23.200	0.000	33.000	58.896	5	28.00	16.00
1	20.600	0.7203	20.600	0.000	31.000	58.515	5	19.00	16.00
10	22.200	0.7762	22.200	11.000	29.000	32.389	5	21.00	16.00
100	23.400	0.8182	23.400	10.000	36.000	45.388	5	25.00	16.00
1000	23.000	0.8042	23.000	10.000	29.000	34.373	5	22.00	16.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$)	0.88877	0.9	-1.1607	0.96516
Bartlett's Test indicates equal variances ($p = 0.07$)	10.1316	15.0863		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	1000	>1000		

Dose-Response Plot



Bioassay Laboratory
5550 Morehouse Dr., Suite B
San Diego, CA 92121

Client: Beazler

Sample ID: PSA

Initials: _____ Pin: _____ Item: _____
Seven Day Chronic Bioassay

Test Species: C. dubia

Test Date/Time: 11/27/02 14:15

Test No: 0211-348

Concentration	Lab Control							
Day	0	1	2	3	4	5	6	7
pH	8.04	8.16	8.12	8.06	8.29	8.19	8.06	
DO (mg/L)	8.1	8.12	8.3	8.2	8.3	8.0	7.7	
Cond. (µmhos-cm)	178	186	185	190	177	178	179	
Temp (°C)	24.7	24.9	24.6	24.8	24.0	24.0	24.1	
pH		8.22	8.13	8.15	8.07	8.0	8.02	8.06
DO (mg/L)		8.6	8.2	8.4	8.3	8.0	7.8	8.0
Temp (°C)		24.3	24.6	24.4	24.3	24.1	24.6	24.2

Concentration	10 mg/L							
Day	0	1	2	3	4	5	6	7
pH	8.01	8.20	8.10	8.16	8.26	8.14	8.11	
DO (mg/L)	8.0	8.1	8.3	8.2	8.4	8.1	7.8	
Cond. (µmhos-cm)	180	184	185	196	182	185	182	
Temp (°C)	24.7	24.5	24.6	24.0	24.0	24.0	24.0	
pH		8.30	8.17	8.21	8.1	8.05	8.05	8.07
DO (mg/L)		8.5	8.3	8.4	8.5	7.9	8.0	8.0
Temp (°C)		24.3	24.6	24.4	24.3	24.1	24.6	24.2

Concentration	0.1 mg/L							
Day	0	1	2	3	4	5	6	7
pH	8.04	8.17	8.14	8.17	8.29	8.17	8.10	
DO (mg/L)	8.0	8.12	8.3	8.1	8.4	8.0	8.0	
Cond. (µmhos-cm)	179	179	180	190	177	181	182	
Temp (°C)	24.7	24.5	24.6	24.0	24.0	24.0	24.1	
pH		8.27	8.16	8.19	8.07	8.02	8.04	8.10
DO (mg/L)		8.5	8.3	8.6	8.5	8.1	7.8	8.0
Temp (°C)		24.3	24.6	24.4	24.3	24.1	24.6	24.2

Concentration	100 mg/L							
Day	0	1	2	3	4	5	6	7
pH	7.83	8.25	7.89	7.93	8.04	7.95	7.93	
DO (mg/L)	8.0	8.1	8.4	8.2	8.4	8.0	7.9	
Cond. (µmhos-cm)	208	215	209	223	204	212	211	
Temp (°C)	24.7	24.1	24.5	24.0	24.0	24.0	24.0	
pH		8.31	8.16	8.18	8.1	8.03	8.04	8.06
DO (mg/L)		8.2	8.2	8.4	8.5	7.9	8.0	7.9
Temp (°C)		24.3	24.6	24.4	24.3	24.1	24.6	24.2

Concentration	1.0 mg/L							
Day	0	1	2	3	4	5	6	7
pH	8.03	8.24	8.15	8.19	8.29	8.17	8.11	
DO (mg/L)	8.0	8.1	8.3	8.2	8.3	8.0	7.8	
Cond. (µmhos-cm)	179	180	180	192	179	181	182	
Temp (°C)	24.7	24.5	24.7	24.0	24.0	24.0	24.1	
pH		8.28	8.18	8.22	8.14	8.04	8.05	8.08
DO (mg/L)		8.5	8.4	8.6	8.3	8.1	7.9	8.1
Temp (°C)		24.3	24.6	24.4	24.3	24.1	24.6	24.2

Concentration	1000 mg/L							
Day	0	1	2	3	4	5	6	7
pH	7.43	8.21	7.39	7.45	7.96	7.49	7.48	
DO (mg/L)	8.1	8.31	8.7	8.4	8.8	8.2	8.0	
Cond. (µmhos-cm)	454	540	448	473	444	452	451	
Temp (°C)	24.7	24.0	24.0	24.0	24.0	24.0	24.0	
pH		8.23	8.02	8.05	8.10	7.94	8.01	8.01
DO (mg/L)		8.5	8.2	8.4	8.5	8.0	7.9	7.9
Temp (°C)		24.3	24.6	24.4	24.3	24.1	24.6	24.2

Comments:

range finder test

Animal Source:

Internal

QA Check:

1/14/03

Analysis:

OK, 1/14/03

Date Received:

NA

Final Review:

OK 1/14/03

AMEC Earth and Environmental
Bioassay Laboratory
5550 Morehouse Dr., Suite B
San Diego, CA 92121

Daphnia Survival and Reproduction Datasheet

Client/Sample ID: Bla3ur / PSA

Start Date: 11/27/02

End Date: 12/4/02

Test Number: 02M-348

Start Time: 14:15

End Time: 1300

		Daily Reproduction/ Survival								Total	QA
Conc.	Rep	1	2	3	4	5	6	7	8		
LC	1	50	0	0	0	0	0	✓	-	0	
	2	0	0	5	9	0	15	✓	-	29	
	3	0	0	0	7	5	11	✓	-	23	
	4	0	0	0	7	6	12	✓	-	25	
	5	0	0	0	6	7	10	✓	-	23	11
Analyst		SH	BR	SC	AT	DB	MD	BR	SA	DB	

		Daily Reproduction/ Survival								Total	QA
Conc.	Rep	1	2	3	4	5	6	7	8		
10 mg/L	1	0	0	0	3	10	9	✓	-	22	
	2	0	0	5	0	11	16	✓	-	32	
	3	0	0	0	6	9	15	✓	-	30	
	4	0	0	old	-	-	-	-	-	old	
	5	0	0	0	4	7	13	✓	-	24	12

		Daily Reproduction/ Survival								Total	QA
Conc.	Rep	1	2	3	4	5	6	7	8		
0.1 mg/L	1	0	0	0	10	4	11	✓	-	21	
	2	0	0	0	6	8	12	✓	-	26	
	3	0	0	old	-	-	-	-	-	old	
	4	0	0	0	5	10	13	✓	-	28	
	5	0	0	0	4	7	9	✓	-	20	8

		Daily Reproduction/ Survival								Total	QA
Conc.	Rep	1	2	3	4	5	6	7	8		
100 mg/L	1	0	0	0	4	7	12	✓	-	23	
	2	0	0	0	4	8	11	✓	-	23	
	3	0	0	0	5	8	13	✓	-	26	
	4	0	0	0	6	9	13	✓	-	28	
	5	0	0	0	3	5	10	✓	-	18	11

		Daily Reproduction/ Survival								Total	QA
Conc.	Rep	1	2	3	4	5	6	7	8		
1.0 mg/L	1	0	0	0	7	9	13	✓	-	29	
	2	0	old	-	-	-	-	-	-	old	
	3	0	0	0	7	8	15	✓	-	30	
	4	0	old	-	-	-	-	-	-	old	
	5	0	0	0	7	10	14	✓	-	31	16

		Daily Reproduction/ Survival								Total	QA
Conc.	Rep	1	2	3	4	5	6	7	8		
1000 mg/L	1	0	0	0	3	3	6	✓	-	12	
	2	0	0	0	3	6	6	✓	-	15	
	3	0	0	6	5	0	4	✓	-	15	
	4	0	0	0	3	7	3	✓	-	13	
	5	0	0	0	2	3	8	✓	-	13	8

Time Fed (day): (0) 1415 (1) 0930 (2) 1240 (3) 1050 (4) 1500 (5) 1330 (6) 1615 (7) 1405 (8) _____

Comments: _____

QA Check: 1/14/03

Final Review: 4/14/03

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

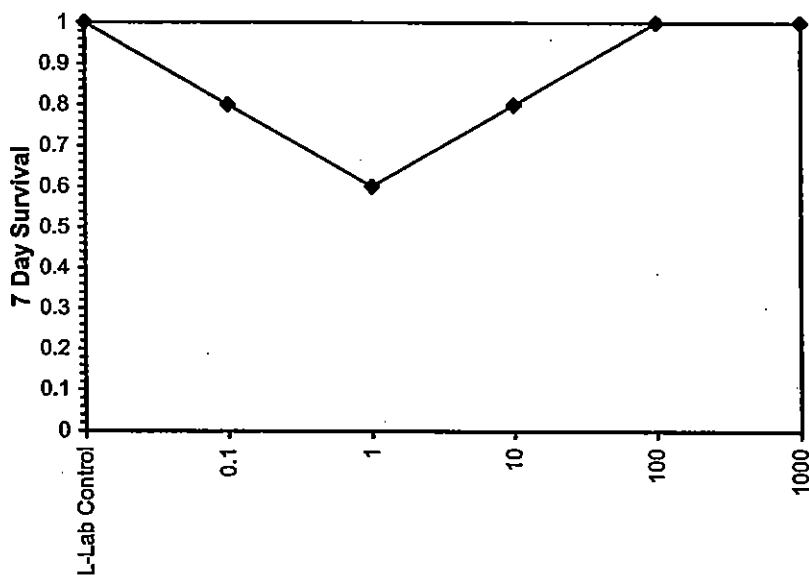
Start Date: 11/27/2002 Test ID: 0211-348 Sample ID: BEAZER
 End Date: 12/04/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: PSA
 Sample Date: Protocol: EPAF 94-EPA Freshwater Ct Test Species: CD-Ceriodaphnia dubia
 Comments: Industrial product testing

Conc-mg/L	1	2	3	4	5
L-Lab Control	1.0000	1.0000	1.0000	1.0000	1.0000
0.1	1.0000	1.0000	0.0000	1.0000	1.0000
1	1.0000	0.0000	1.0000	0.0000	1.0000
10	1.0000	1.0000	1.0000	0.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-mg/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
L-Lab Control	1.0000	1.0000	0	5	5	5		
0.1	0.8000	0.8000	1	4	5	5	0.5000	0.0500
1	0.6000	0.6000	2	3	5	5	0.2222	0.0500
10	0.8000	0.8000	1	4	5	5	0.5000	0.0500
100	1.0000	1.0000	0	5	5	5	1.0000	0.0500
1000	1.0000	1.0000	0	5	5	5	1.0000	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	1000	>1000		

Dose-Response Plot



Ceriodaphnia Survival and Reproduction Test-Reproduction

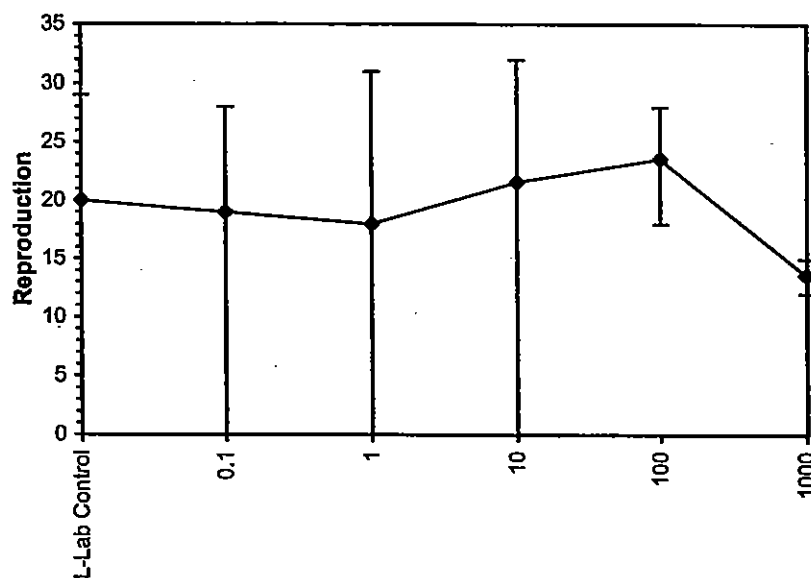
Start Date: 11/27/2002	Test ID: 0211-348	Sample ID: BEAZER
End Date: 12/04/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: PSA
Sample Date:	Protocol: EPAF 94-EPA Freshwater Cr Test Species:	CD-Ceriodaphnia dubia
Comments: Industrial product testing		

Conc-mg/L	1	2	3	4	5
L-Lab Control	0.000	29.000	23.000	25.000	23.000
0.1	21.000	26.000	0.000	28.000	20.000
1	29.000	0.000	30.000	0.000	31.000
10	22.000	32.000	30.000	0.000	24.000
100	23.000	23.000	26.000	28.000	18.000
1000	12.000	15.000	15.000	13.000	13.000

Conc-mg/L	Mean	N-Mean	Transform: Untransformed				N	Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%			
L-Lab Control	20.000	1.0000	20.000	0.000	29.000	57.228	5		
0.1	19.000	0.9500	19.000	0.000	28.000	58.608	5	25.50	16.00
1	18.000	0.9000	18.000	0.000	31.000	91.372	5	30.50	16.00
10	21.600	1.0800	21.600	0.000	32.000	59.071	5	29.50	16.00
100	23.600	1.1800	23.600	18.000	28.000	16.023	5	28.00	16.00
1000	13.600	0.6800	13.600	12.000	15.000	9.865	5	20.00	16.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$)	0.85053	0.9	-1.0686	0.33102
Bartlett's Test indicates unequal variances ($p = 2.86E-03$)	18.0718	15.0863		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	1000	>1000		

Dose-Response Plot



Pimephales promelas

Freshwater 96-hr Acute with Renewal

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Beazer
 Sample ID: BMBSA
 Contact: _____
 Test #: 0211-338

Start Date & Time: 11/27/02 1510
 End Date & Time: 12/01/02 1320
 Test Organism: P. promelas
 Test Protocol: EPA 1994 WET, EPA OPPTS 1996

Concentration mg/L	Rep	Number of Live Organisms					D.O. (mg/L)						pH (pH units)						Conductivity (µmhos-cm)				Test Temperature (°C)						% Surv.
							Init. Fin.						Init. Fin.						Init. Fin.				Init. Fin.						
		0	24	48	72	96	0	24	48	48	72	96	0	24	48	48	72	96	0	48	48	96	0	24	48	48	72	96	
Lab control	A	10	10	10	10	10	8.0	8.0	8.9	-	8.1	8.2	8.05	7.86	7.70	-	7.73	7.71	182	200	-	201	20.0	20.0	20.2	-	20.3	20.2	100
	B	10	10	10	10	10																						100	
0.1	A	10	10	10	10	10	7.9	8.0	8.8	-	8.1	8.2	8.03	7.88	7.74	-	7.77	7.78	179	214	-	217	20.0	20.0	20.0	-	20.1	20.0	100
	B	10	10	10	10	10																						100	
1.0	A	10	10	10	10	10	7.9	8.1	8.9	-	8.3	8.2	8.02	7.89	7.75	-	7.78	7.79	180	215	-	217	20.0	20.0	20.0	-	20.0	20.0	100
	B	10	10	10	10	10																						100	
10	A	10	10	10	10	10	7.8	7.6	9.1	-	8.2	7.9	8.03	7.88	7.73	-	7.77	7.77	184	230	-	234	20.0	20.0	20.0	-	19.9	19.9	100
	B	10	10	10	10	10																						100	
100	A	10	10	10	10	10	7.8	7.9	8.7	-	7.8	7.9	8.08	7.90	7.73	-	7.75	7.78	238	270	-	275	20.0	19.9	20.0	-	19.9	19.9	100
	B	10	10	10	10	10																						100	
1000	A	10	10	10	10	10	8.0	7.9	9.1	-	8.3	8.2	8.15	7.96	7.81	-	7.84	7.89	741	750	-	747	20.0	20.0	20.0	-	19.9	20.0	100
	B	10	10	10	10	10																						100	
	A																												
	B																												
Technician Initials		MD	AT	AY	AT	RB																							

Animal Source: ABSDate Received: 11/26/02

Comments: 0 hrs: range finder test, fish 11 days old @ initiation
 24 hrs: _____
 48 hrs: Ed @ 08:45
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check: Bcs 12/02/02Final Review: QF 1/11/03

Acute Fish Test-96 Hr Survival

Start Date: 11/27/2002	Test ID: 0211-338	Sample ID: BEAZER
End Date: 12/01/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: BMDSA - Benzene Metadisulfonic Acid
Sample Date:	Protocol: EPAA 93-EPA Acute	Test Species: PP-Pimephales promelas

Comments: Industrial product testing

Conc-mg/L	1	2
L-Lab Control	1.0000	1.0000
0.1	1.0000	1.0000
1	1.0000	1.0000
10	1.0000	1.0000
100	1.0000	1.0000
1000	1.0000	1.0000

Conc-mg/L	Transform: Arcsin Square Root							Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
L-Lab Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	1.0000	1.0000
0.1	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	1.0000	1.0000
1	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	1.0000	1.0000
10	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	1.0000	1.0000
100	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	1.0000	1.0000
1000	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	1.0000	1.0000

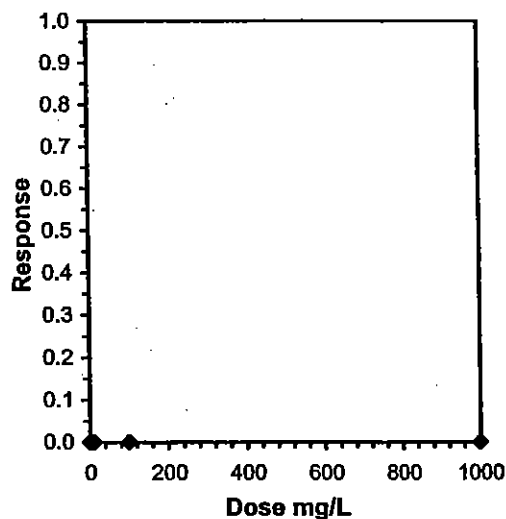
Auxiliary Tests

Normality of the data set cannot be confirmed

Equality of variance cannot be confirmed

Linear Interpolation (200 Resamples)

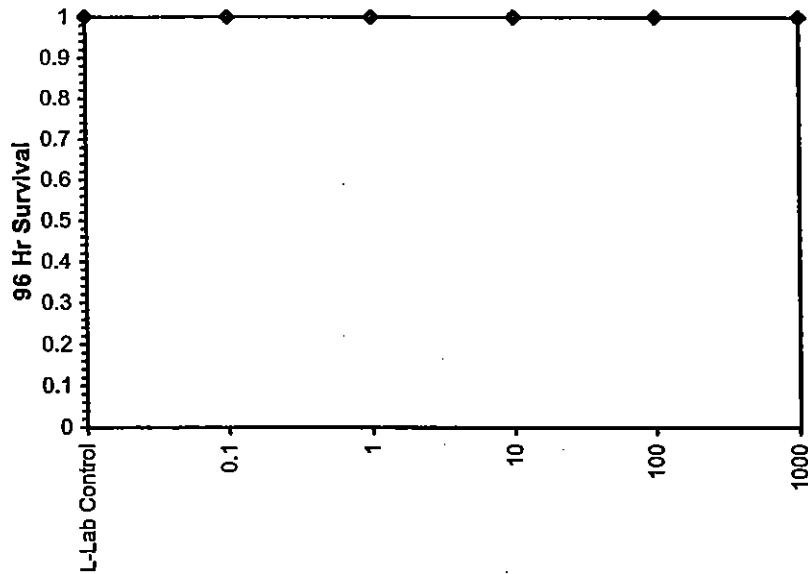
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>1000			
IC10	>1000			
IC15	>1000			
IC20	>1000			
IC25	>1000			
IC40	>1000			
IC50	>1000			



Acute Fish Test-96 Hr Survival

Start Date: 11/27/2002	Test ID: 0211-338	Sample ID: BEAZER
End Date: 12/01/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: BMDSA - Benzene Metadisulfonic Acid
Sample Date:	Protocol: EPAA 93-EPA Acute	Test Species: PP-Pimephales promelas
Comments: Industrial product testing		

Dose-Response Plot



Freshwater 96-hr Acute with Renewal

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Blaizer
 Sample ID: BMSA
 Contact: _____
 Test #: 0211-339

Start Date & Time: 11/27/02 1510
 End Date & Time: 12/01/02 1320
 Test Organism: P. promelas
 Test Protocol: EPA 1994 WET, EPA OPPTS 1926

Concentration mg/L	Rep	Number of Live Organisms					D.O. (mg/L)					pH (pH units)					Conductivity (µmhos-cm)				Test Temperature (°C)						% Surv.		
							Init. Fin.					Init. Fin.					Init. Fin.		Init. Fin.		Init. Fin.								
		0	24	48	72	96	0	24	48	48	72	96	0	24	48	48	72	96	0	48	48	96	0	24	48	48		72	96
Lab control	A	10	10	10	10	10	8.2	7.9	9.1	-	8.3	8.0	8.24	7.83	7.72	-	7.73	7.64	179	215	-	213	20.0	20.2	20.2	-	20.3	20.3	100
	B	10	10	10	10	10																						100	
0.1	A	10	10	10	10	10	8.2	7.8	9.0	-	8.2	8.2	8.22	7.85	7.73	-	7.72	7.72	179	217	-	220	20.0	20.2	20.2	-	20.1	20.2	100
	B	10	10	10	10	10																						100	
1.0	A	10	10	10	10	10	8.1	8.1	9.2	-	8.4	8.30	8.19	7.88	7.76	-	7.76	7.77	180	200	-	202	20.0	20.0	20.0	-	20.0	20.0	100
	B	10	10	10	10	10																						100	
10	A	10	10	10	10	10	8.1	8.0	8.7	-	8.2	8.10	8.23	7.88	7.74	-	7.76	7.77	181	221	-	223	20.0	20.0	20.0	-	20.0	20.0	100
	B	10	10	10	10	10																						100	
100	A	10	10	10	10	10	8.1	8.0	9.0	-	7.2	7.8	8.24	7.87	7.71	-	7.74	7.77	218	256	-	261	20.0	20.0	20.0	-	20.0	20.0	100
	B	10	10	10	10	10																						100	
1000	A	10	10	10	10	10	8.3	8.0	9.5	-	8.0	8.1	8.29	7.93	7.78	-	7.77	7.85	550	562	-	566	20.0	20.0	20.0	-	19.9	20.0	100
	B	10	10	10	10	10																						100	
	A																												
	B																												
Technician Initials		MD	WJ	AY	AR	RG																							

Animal Source: ABSDate Received: 11/20/02

Comments: 0 hrs: range finder test, fish 11 days old @ initiation
 24 hrs: _____
 48 hrs: fed @ 08:45
 72 hrs: _____
 96 hrs: _____

QA Check: BGS 12/02/02Final Review: af Vltos

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

Acute Fish Test-96 Hr Survival

Start Date: 11/27/2002	Test ID: 0211-339	Sample ID: BEAZER
End Date: 12/01/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: BMSA - Benzene Monosulfonic Acid
Sample Date:	Protocol: EPAA 93-EPA Acute	Test Species: PP-Pimephales promelas
Comments: Industrial product testing		

Conc-mg/L	1	2
L-Lab Control	1.0000	1.0000
0.1	1.0000	1.0000
1	1.0000	1.0000
10	1.0000	1.0000
100	1.0000	1.0000
1000	1.0000	1.0000

Transform: Arcsin Square Root

Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Isotonic Mean	N-Mean
L-Lab Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	1.0000	1.0000
0.1	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	1.0000	1.0000
1	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	1.0000	1.0000
10	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	1.0000	1.0000
100	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	1.0000	1.0000
1000	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	1.0000	1.0000

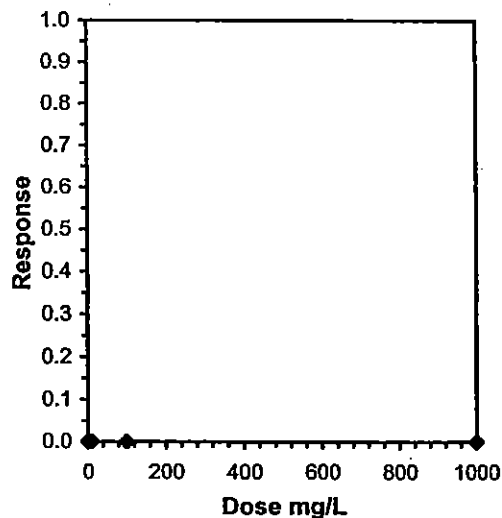
Auxiliary Tests

Normality of the data set cannot be confirmed
Equality of variance cannot be confirmed

Statistic Critical Skew Kurt

Linear Interpolation (200 Resamples)

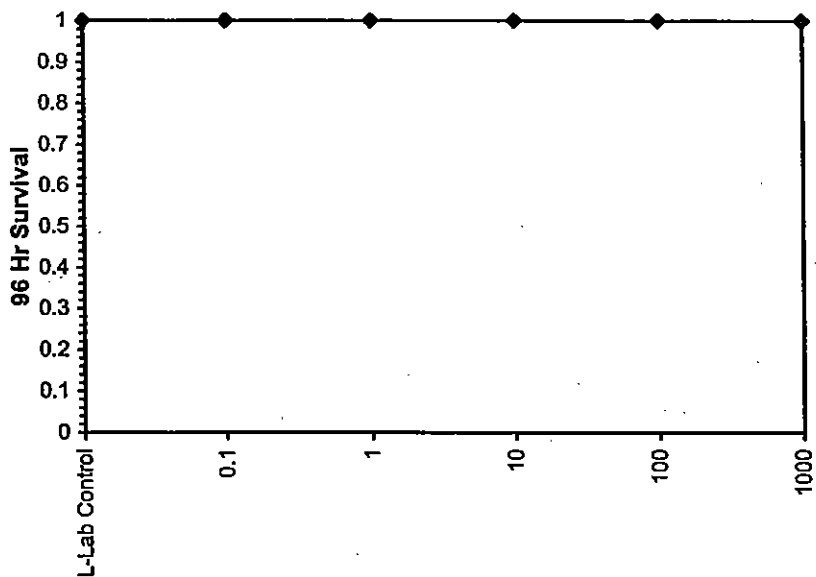
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>1000			
IC10	>1000			
IC15	>1000			
IC20	>1000			
IC25	>1000			
IC40	>1000			
IC50	>1000			



Acute Fish Test-96 Hr Survival

Start Date: 11/27/2002	Test ID: 0211-339	Sample ID: BEAZER
End Date: 12/01/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: BMSA - Benzene Monosulfonic Acid
Sample Date:	Protocol: EPAA 93-EPA Acute	Test Species: PP-Pimephales promelas
Comments: Industrial product testing		

Dose-Response Plot



Freshwater 96-hr Acute with Renewal

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: BCGZUR
 Sample ID: PSA
 Contact: _____
 Test #: 0211-337

Start Date & Time: 11/27/02 1510
 End Date & Time: 12/1/02 1320
 Test Organism: P. promelas
 Test Protocol: EPA 1995st, EPA OPPTS 1976

Concentration mg/L	Rep	Number of Live Organisms					D.O. (mg/L)						pH (pH units)						Conductivity (µmhos-cm)				Test Temperature (°C)						% Surv.
									Init.	Fin.							Init.	Fin.					Init.	Fin.					
		0	24	48	72	96	0	24	48	48	72	96	0	24	48	48	72	96	0	48	48	96	0	24	48	48	72	96	
lab control	A	10	10	10	10	10	8.2	8.1	7.8	—	8.4	8.5	8.04	7.90	7.75	—	7.73	7.74	178	226	227 227	227	20.0	20.0	20.2	—	20.3	20.2	100
	B	10	10	10	10	10																						100	
0.1	A	10	10	8	8	8	8.0	8.0	7.5	—	7.3	8.0	8.04	7.93	7.73	—	7.65	7.77	179	209	—	215	20.0	20.0	20.2	—	20.1	20.2	80
	B	10	10	10	10	10																						100	
1.0	A	10	10	10	10	10	8.0	8.0	7.4	—	7.4	8.2	8.03	7.93	7.75	—	7.64	7.76	179	208	—	213	20.0	20.0	20.2	—	20.1	20.2	100
	B	10	10	10	10	10																						100	
10	A	10	10	10	10	10	8.0	8.1	7.4	—	7.7	8.3	8.01	7.93	7.78	—	7.66	7.76	180	209	—	212	20.0	20.0	20.2	—	20.1	20.2	100
	B	10	10	10	10	10																						100	
100	A	10	10	10	10	10	8.0	8.1	9.0	—	7.9	8.0	7.83	7.95	7.81	—	7.70	7.68	208	226	—	227	20.0	20.0	20.1	—	20.0	20.3	100
	B	10	10	10	10	10																						100	
1000	A	10	10	10	10	10	8.1	8.2	9.1	—	8.1	8.2	7.43	7.91	7.84	—	7.80	7.81	454	469	—	473	20.0	20.0	20.0	—	20.0	20.0	100
	B	10	10	10	10	10																						100	
	A																												
	B																												
Technician Initials		MDA					R6																						

Animal Source: ABSDate Received: 11/26/02

Comments: 0 hrs: reings finder test, fish 11 days old @ initiation
 24 hrs: _____
 48 hrs: fed @ 08:45
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check: BCS 12/02/02Final Review: YH 03

Acute Fish Test-96 Hr Survival

Start Date: 11/27/2002	Test ID: 0211-337	Sample ID: BEAZER
End Date: 12/01/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: PSA - P-Phenol Sulfonic Acid
Sample Date:	Protocol: EPAA 93-EPA Acute	Test Species: PP-Pimephales promelas
Comments: Industrial product testing		

Conc-mg/L	1	2
L-Lab Control	1.0000	1.0000
0.1	0.8000	1.0000
1	1.0000	1.0000
10	1.0000	1.0000
100	1.0000	1.0000
1000	1.0000	1.0000

Conc-mg/L	Transform: Arcsin Square Root							Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
L-Lab Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	1.0000	1.0000
0.1	0.9000	0.9000	1.2596	1.1071	1.4120	17.115	2	0.9800	0.9800
1	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	0.9800	0.9800
10	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	0.9800	0.9800
100	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	0.9800	0.9800
1000	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	0.9800	0.9800

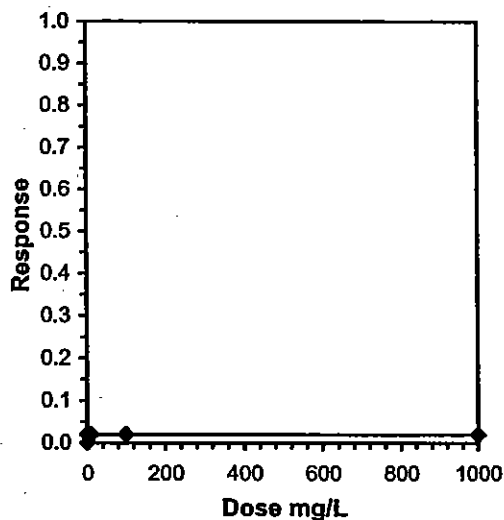
Auxiliary Tests

Normality of the data set cannot be confirmed
Equality of variance cannot be confirmed

Statistic Critical Skew Kurt

Linear Interpolation (200 Resamples)

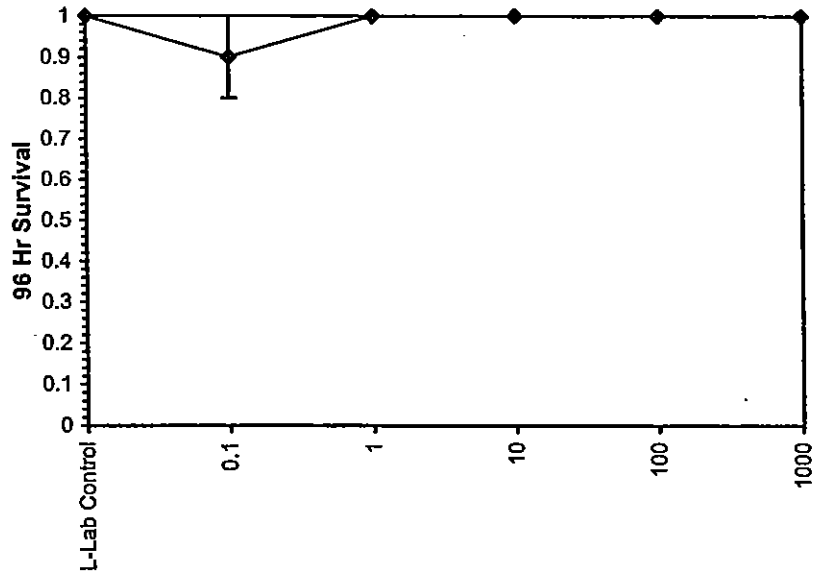
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>1000			
IC10	>1000			
IC15	>1000			
IC20	>1000			
IC25	>1000			
IC40	>1000			
IC50	>1000			



Acute Fish Test-96 Hr Survival

Start Date: 11/27/2002	Test ID: 0211-337	Sample ID: BEAZER
End Date: 12/01/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: PSA - P-Phenol Sulfonic Acid
Sample Date:	Protocol: EPAA 93-EPA Acute	Test Species: PP-Pimephales promelas
Comments: Industrial product testing		

Dose-Response Plot



Hyalella azteca

Client: BioZer
 Sample ID: BMDSA
 Contact: _____
 Test #: 0211-361

Start Date & Time: 11/27/02 1730
 End Date & Time: 11/10/02 1648
 Test Organism: H. azteca
 Test Protocol: ASTM 1994, EPA OPPTS 1996

Concentration mg/L	Rep	Number of Live Organisms					D.O. (mg/L)					pH (pH units)					Conductivity (µmhos-cm)				Test Temperature (°C)					% Surv.			
									Init.	Fin.					Init.	Fin.					Init.	Fin.						Init.	Fin.
		0	24	48	72	96	0	24	48	48	72	96	0	24	48	48	72	96	0	48	48	96	0	24	48		48	72	96
Lab cont.	A	10				8	8.0	8.5	8.4	-	8.6	8.6	8.05	7.9	7.84	-	7.86	7.77	182	184	-	185	20.0	20.5	20.5	-	20.4	20.5	80
	B	10				10																						100	
	C	10				10																						100	
0.1	A	10				10	7.9	8.5	8.3	-	8.6	8.6	8.03	7.93	7.87	-	7.87	7.85	179	188	-	189	20.0	20.4	20.4	-	20.4	20.5	100
	B	10				8																						80	
	C	10				10																						100	
1.0	A	10				10	7.9	8.6	8.4	-	8.7	8.6	8.02	7.96	7.89	-	7.90	7.88	180	186	-	187	20.0	20.3	20.3	-	20.3	20.5	100
	B	10				10																						100	
	C	10				11																						100	
10	A	10				10	7.8	8.5	8.5	-	8.6	8.4	8.03	7.97	7.92	-	7.90	7.88	184	192	-	192	20.0	20.4	20.4	-	20.4	20.5	100
	B	10				10																						100	
	C	10				8																						80	
100	A	10				10	7.8	8.5	8.4	-	8.7	8.4	8.08	7.99	7.93	-	7.93	7.88	238	242	-	242	20.0	20.5	20.4	-	20.4	20.5	100
	B	10				10																						100	
	C	10				10																						100	
1000	A	10				8	8.0	8.4	8.1	-	8.5	8.4	8.15	8.05	7.95	-	7.92	7.87	744	724	-	719	20.0	20.5	20.5	-	20.4	20.5	80
	B	10				9																						90	
	C	10				10																						100	
Technician Initials		P6				10																							

Animal Source: ABSDate Received: 11/26/02

Comments: 0 hrs: range finder test, 9-12 days old @ initiation
 24 hrs: _____
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check: BOS 12/02/02Final Review: 1/14/03

Amphipod 96-Hr Survival Bioassay-96 Hr Survival

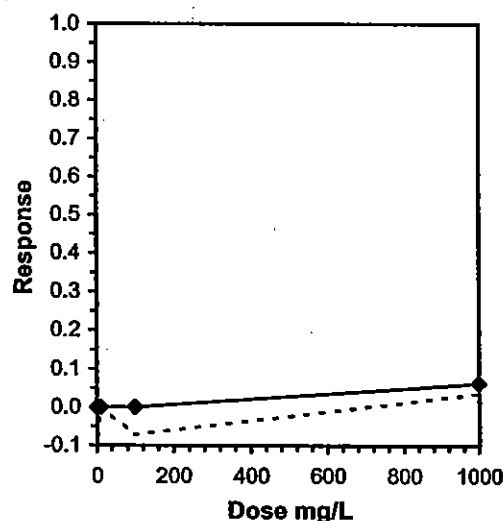
Start Date: 11/27/2002	Test ID: 0211-341	Sample ID: BEAZER
End Date: 12/01/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: BMDSA - Benzene Metadisulfonic Acid
Sample Date:	Protocol: ASTM 94	Test Species: HA-Hyalella azteca
Comments: Industrial product testing		

Conc-mg/L	1	2	3
L-Lab Control	0.8000	1.0000	1.0000
0.1	1.0000	0.8000	1.0000
1	1.0000	1.0000	1.0000
10	1.0000	1.0000	0.8000
100	1.0000	1.0000	1.0000
1000	0.8000	0.9000	1.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
L-Lab Control	0.9333	1.0000	1.3104	1.1071	1.4120	13.432	3				0.9600	1.0000
0.1	0.9333	1.0000	1.3104	1.1071	1.4120	13.432	3	0.000	2.500	0.2841	0.9600	1.0000
1	1.0000	1.0714	1.4145	1.4120	1.4195	0.304	3	-0.916	2.500	0.2841	0.9600	1.0000
10	0.9333	1.0000	1.3104	1.1071	1.4120	13.432	3	0.000	2.500	0.2841	0.9600	1.0000
100	1.0000	1.0714	1.4120	1.4120	1.4120	0.000	3	-0.894	2.500	0.2841	0.9600	1.0000
1000	0.9000	0.9643	1.2561	1.1071	1.4120	12.145	3	0.478	2.500	0.2841	0.9000	0.9375

Auxiliary Tests					Statistic	Critical	Skew	Kurt			
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)					0.84021	0.858	-0.7615	-0.5454			
Equality of variance cannot be confirmed											
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		1000	>1000			0.20204	0.21638	0.01218	0.01937	0.68171	5, 12

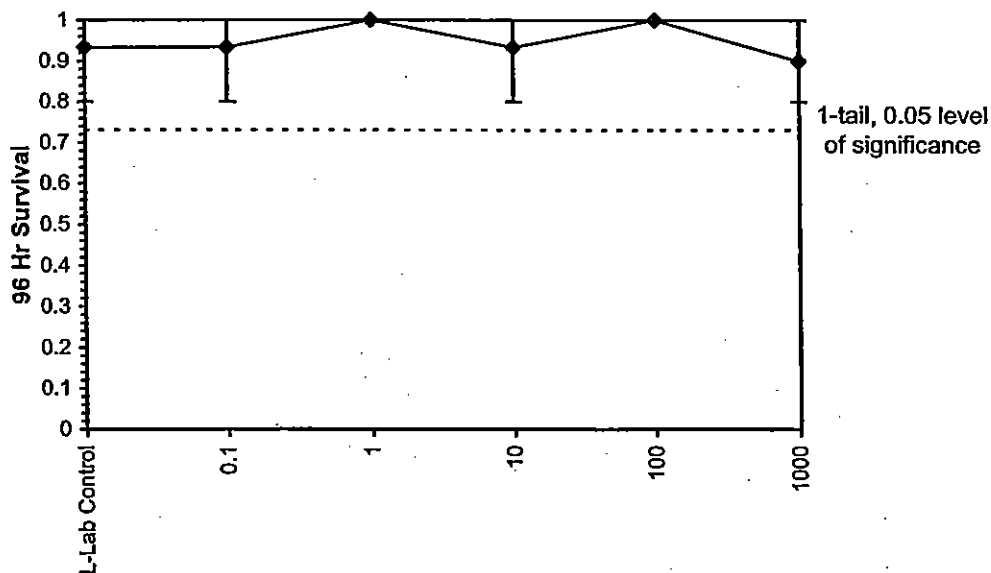
Linear Interpolation (200 Resamples)				
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	820.00			
IC10	>1000			
IC15	>1000			
IC20	>1000			
IC25	>1000			
IC40	>1000			
IC50	>1000			



Amphipod 96-Hr Survival Bioassay-96 Hr Survival

Start Date: 11/27/2002	Test ID: 0211-341	Sample ID: BEAZER
End Date: 12/01/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: BMDSA - Benzene Metadisulfonic Acid
Sample Date:	Protocol: ASTM 94	Test Species: HA-Hyalella azteca
Comments: Industrial product testing		

Dose-Response Plot



Freshwater 96-hr Acute with Renewal

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Beazer
 Sample ID: BMSA
 Contact: _____
 Test #: D211-3A2

Start Date & Time: 11/27/02 1330
 End Date & Time: 12/1/02
 Test Organism: Haztec 1630
 Test Protocol: ASTM 1994 OPPTS 1996

Concentration mg/L	Rep	Number of Live Organisms					D.O. (mg/L)						pH (pH units)						Conductivity (µmhos-cm)						Test Temperature (°C)						% Surv.
							Init. Fin.						Init. Fin.						Init. Fin.						Init. Fin.						
		0	24	48	72	96	0	24	48	48	72	96	0	24	48	48	72	96	0	48	48	96	0	24	48	48	72	96			
Lab cont.	A	10				8	8.2	8.5	8.4	-	8.8	8.6	8.24	7.88	7.82	-	7.83	7.71	179	185	-	184	20.0	20.5	20.4	-	20.4	20.6	80		
	B	10				10																						100			
	C	10				10																						100			
0.1	A	10				9	8.2	8.7	8.4	-	8.8	8.5	8.22	7.91	7.89	-	7.89	7.87	179	188	-	190	20.0	20.4	20.4	-	20.4	20.4	90		
	B	10				10																						100			
	C	10				10																						100			
1.0	A	10				10	8.1	8.7	8.5	-	8.8	8.4	8.19	7.94	7.91	-	7.92	7.89	180	185	-	186	20.0	20.4	20.4	-	20.4	20.4	100		
	B	10				11																						100			
	C	10				12																						100			
10	A	10				8	8.1	8.6	8.5	-	8.8	8.4	8.23	7.96	7.90	-	7.93	7.88	181	188	-	189	20.0	20.4	20.4	-	20.4	20.5	80		
	B	10				10																						100			
	C	10				9																						90			
100	A	10				9	8.1	8.6	8.3	-	8.7	8.56	8.24	7.98	7.91	-	7.95	7.84	218	222	-	223	20.0	20.4	20.4	-	20.4	20.5	90		
	B	10				10																						100			
	C	10				10																						100			
1000	A	10				8	8.3	8.6	8.3	-	8.8	8.40	8.29	8.03	7.98	-	7.96	7.96	550	541	-	540	20.0	20.5	20.4	-	20.4	20.5	80		
	B	10				11																						100			
	C	10				10																						100			
Technician Initials		DG				76																									

Animal Source: ABSDate Received: 11/26/02

Comments: 0 hrs: range finder test, 9-12 days old @ initiation
 24 hrs: _____
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check: Bcs 12/62/02Final Review: 1/14/03

Amphipod 96-Hr Survival Bioassay-96 Hr Survival

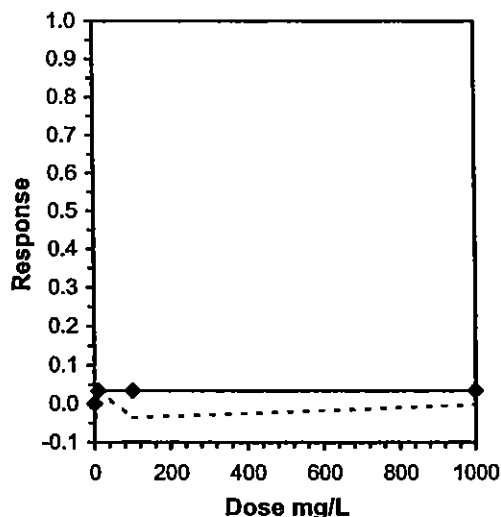
Start Date: 11/27/2002	Test ID: 0211-342	Sample ID: BEAZER
End Date: 12/01/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: BMSA - Benzene Monosulfonic Acid
Sample Date:	Protocol: ASTM 94	Test Species: HA-Hyalella azteca
Comments: Industrial product testing		

Conc-mg/L	1	2	3
L-Lab Control	0.8000	1.0000	1.0000
0.1	0.9000	1.0000	1.0000
1	1.0000	1.0000	1.0000
10	0.8000	1.0000	0.9000
100	0.9000	1.0000	1.0000
1000	0.8000	1.0000	1.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed		Isotonic	
			Mean	Min	Max	CV%	N		Critical	MSD	Mean	N-Mean
L-Lab Control	0.9333	1.0000	1.3104	1.1071	1.4120	13.432	3				0.9667	1.0000
0.1	0.9667	1.0357	1.3577	1.2490	1.4120	6.930	3	-0.441	2.500	0.2684	0.9667	1.0000
1	1.0000	1.0714	1.4145	1.4120	1.4195	0.304	3	-0.970	2.500	0.2684	0.9667	1.0000
10	0.9000	0.9643	1.2561	1.1071	1.4120	12.145	3	0.506	2.500	0.2684	0.9341	0.9663
100	0.9667	1.0357	1.3577	1.2490	1.4120	6.930	3	-0.441	2.500	0.2684	0.9341	0.9663
1000	0.9333	1.0000	1.3129	1.1071	1.4195	13.574	3	-0.023	2.500	0.2684	0.9341	0.9663

Auxiliary Tests					Statistic	Critical	Skew	Kurt			
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.90278	0.858	-0.6996	-0.6109			
Bartlett's Test indicates equal variances (p = 0.05)					11.2032	15.0863					
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		1000	>1000			0.18823	0.20159	0.0088	0.01729	0.7643	5, 12

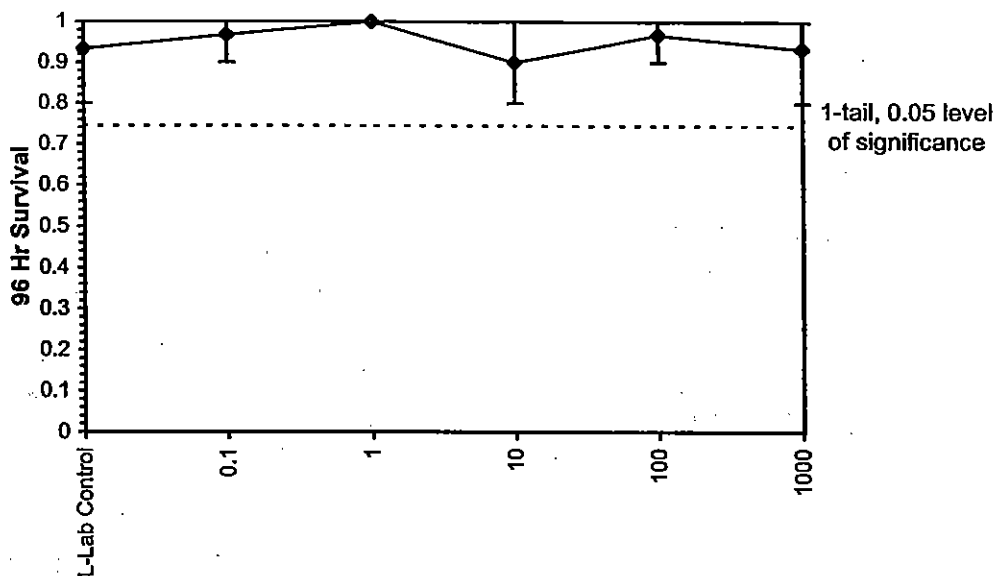
Linear Interpolation (200 Resamples)				
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>1000			
IC10	>1000			
IC15	>1000			
IC20	>1000			
IC25	>1000			
IC40	>1000			
IC50	>1000			



Amphipod 96-Hr Survival Bioassay-96 Hr Survival

Start Date: 11/27/2002 Test ID: 0211-342 Sample ID: BEAZER
End Date: 12/01/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: BMSA - Benzene Monosulfonic Acid
Sample Date: Protocol: ASTM 94 Test Species: HA-Hyaella azteca
Comments: Industrial product testing

Dose-Response Plot



Client: Beazley
 Sample ID: PSA
 Contact: _____
 Test #: 0211-340

Start Date & Time: 11/27/02 1330
 End Date & Time: 12/1/02
 Test Organism: H. azteca / 1600
 Test Protocol: ASTM 1994 / OPPTS 996

Concentration mg/L	Rep	Number of Live Organisms					D.O. (mg/L)					pH (pH units)					Conductivity (µmhos-cm)				Test Temperature (°C)					% Surv.			
									Init.	Fin.					Init.	Fin.				Init.	Fin.			Init.	Fin.				
		0	24	48	72	96	0	24	48	48	72	96	0	24	48	48	72	96	0	48	48	96	0	24	48		48	72	96
Lab water	A	10				9	8.1	8.3	8.3	-	8.9	8.5	8.04	7.95	7.89	-	7.88	8.01	178	184	-	184	20.0	20.5	20.9	-	20.4	20.4	90
	B	10				10																						100	
	C	10				11																						100	
0.1	A	10				10	8.0	8.4	8.5	-	8.9	8.5	8.04	7.97	7.93	-	7.93	7.97	179	186	-	187	20.0	20.4	20.4	-	20.4	20.5	100
	B	10				10																						100	
	C	10				11																						100	
1.0	A	10				10	8.0	8.5	8.5	-	8.9	8.5	8.03	7.96	7.92	-	7.93	7.96	179	185	-	185	20.0	20.5	20.4	-	20.4	20.5	100
	B	10				10																						100	
	C	10				11																						100	
10	A	10				9	8.0	8.6	8.5	-	8.9	8.6	8.01	7.97	7.93	-	7.93	7.92	180	185	-	186	20.0	20.5	20.5	-	20.4	20.5	90
	B	10				10																						100	
	C	10				10																						100	
100	A	10				10	8.0	8.9	8.7	-	8.8	8.6	7.83	7.98	7.97	-	7.98	7.93	208	215	-	216	20.0	20.5	20.5	-	20.4	20.5	100
	B	10				10																						100	
	C	10				9																						90	
1000	A	10				10	8.1	8.7	8.4	-	8.8	8.5	7.43	7.88	7.87	-	7.90	7.86	454	455	-	456	20.0	20.5	20.5	-	20.4	20.5	100
	B	10				10																						100	
	C	10				9																						90	
Technician Initials		DB				DB																							

Animal Source: ABSDate Received: 11/26/02

Comments: 0 hrs: range finder test, 9-12 days old @ initiation
 24 hrs: _____
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check: BCS 12/02/02Final Review: DB 1/14/03

Amphipod 96-Hr Survival Bioassay-96 Hr Survival

Start Date: 11/27/2002	Test ID: 0211-340	Sample ID: BEAZER
End Date: 12/01/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: PSA - P-Phenol Sulfonic Acid
Sample Date:	Protocol: ASTM 94	Test Species: HA-Hyalella azteca
Comments: Industrial product testing		

Conc-mg/L	1	2	3
L-Lab Control	0.9000	1.0000	1.0000
0.1	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000
10	0.9000	1.0000	1.0000
100	1.0000	1.0000	0.9000
1000	1.0000	1.0000	0.9000

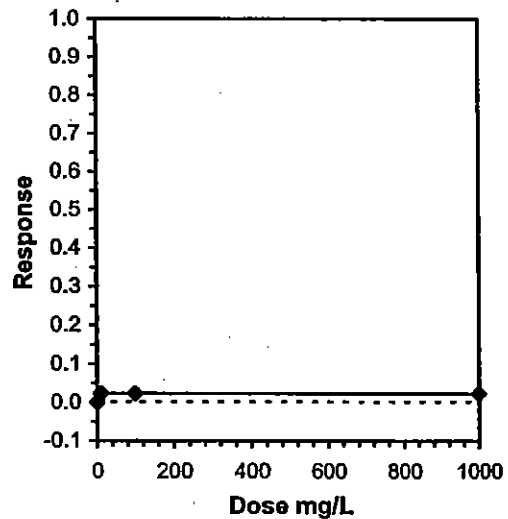
Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
L-Lab Control	0.9667	1.0000	1.3602	1.2490	1.4195	7.081	3				0.9892	1.0000
0.1	1.0000	1.0345	1.4145	1.4120	1.4195	0.304	3	-0.860	2.500	0.1578	0.9892	1.0000
1	1.0000	1.0345	1.4145	1.4120	1.4195	0.304	3	-0.860	2.500	0.1578	0.9892	1.0000
10	0.9667	1.0000	1.3577	1.2490	1.4120	6.930	3	0.039	2.500	0.1578	0.9667	0.9772
100	0.9667	1.0000	1.3577	1.2490	1.4120	6.930	3	0.039	2.500	0.1578	0.9667	0.9772
1000	0.9667	1.0000	1.3577	1.2490	1.4120	6.930	3	0.039	2.500	0.1578	0.9667	0.9772

Auxiliary Tests

Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)					0.76441	0.858	-0.9438	-0.5893		
Bartlett's Test indicates unequal variances (p = 5.22E-03)					16.6449	15.0863				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	1000	>1000			0.08602	0.08995	0.00253	0.00598	0.82415	5, 12

Linear Interpolation (200 Resamples)

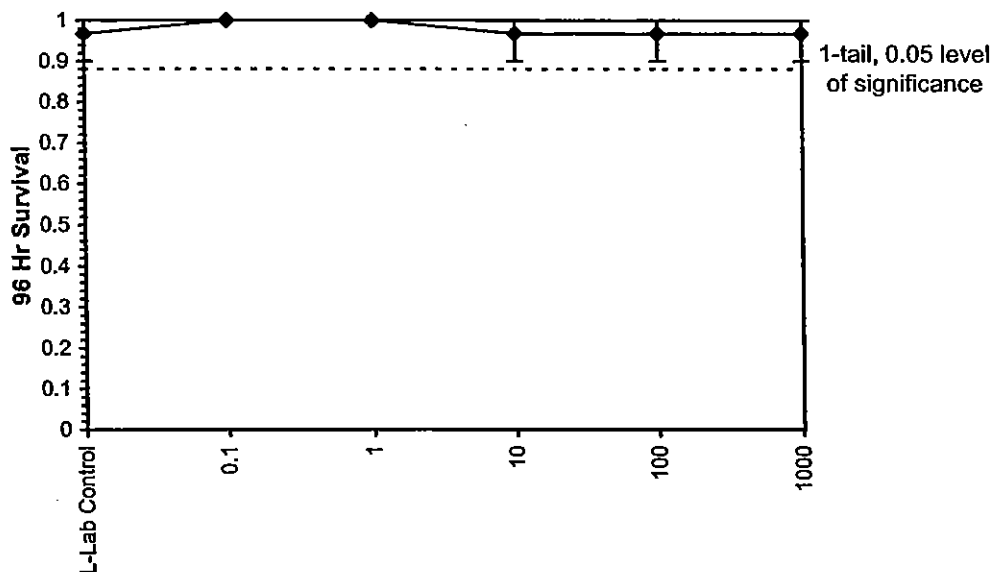
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>1000			
IC10	>1000			
IC15	>1000			
IC20	>1000			
IC25	>1000			
IC40	>1000			
IC50	>1000			



Amphipod 96-Hr Survival Bioassay-96 Hr Survival

Start Date: 11/27/2002 Test ID: 0211-340 Sample ID: BEAZER
End Date: 12/01/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: PSA - P-Phenol Sulfonic Acid
Sample Date: Protocol: ASTM 94 Test Species: HA-Hyalella azteca
Comments: Industrial product testing

Dose-Response Plot



Chironomus tentans

Client: Beazer
 Sample ID: BMDSA
 Contact: _____
 Test #: 0211-344

Start Date & Time: 11/27/02 1430
 End Date & Time: 12-02 1430
 Test Organism: C. tentans
 Test Protocol: ASTM 1994, EPA OPPTS 1996

Concentration <u>mg/L</u>	Rep	Number of Live Organisms					D.O. (mg/L)					pH (pH units)					Conductivity (µmhos-cm)				Test Temperature (°C)					% Surv.			
									Init.	Fin.					Init.	Fin.					Init.	Fin.					Init.	Fin.	
		0	24	48	72	96	0	24	48	48	72	96	0	24	48	48	72	96	0	48	48	96	0	24	48		48	72	96
Lab control	A	10				6	8.0	8.0	8.1		8.6	8.4	8.05	7.88	7.80		7.82	7.81	182	194		193	20.0	20.5	20.5		20.4	20.3	60
	B	10				4																						40	
	C	10				3																						30	
0.1	A	10				8	7.9	8.1	7.9		8.5	8.4	8.03	7.90	7.78		7.83	7.87	179	189		190	20.0	20.3	20.3		20.3	20.2	80
	B	10				6																						60	
	C	10				8																						80	
1.0	A	10				2	7.9	7.7	7.5		8.0	7.9	8.02	7.88	7.73		7.80	7.76	180	191		194	20.0	20.3	20.3		20.3	20.2	20
	B	10				5																						50	
	C	10				7																						70	
10	A	10				6	7.8	8.1	8.1		8.4	8.4	8.03	7.89	7.79		7.81	7.78	184	191		193	20.0	20.3	20.2		20.3	20.2	60
	B	10				4																						40	
	C	10				5																						50	
100	A	10				4	7.8	8.4	8.2		8.3	8.3	8.08	7.94	7.89		7.83	7.80	238	247		246	20.0	20.2	20.2		20.3	20.1	40
	B	10				8																						80	
	C	10				7																						70	
1000	A	10				7	8.0	8.4	8.3		8.5	8.5	8.15	8.05	7.83		7.90	7.87	141	132		128	20.0	20.2	20.2		20.1	20.0	70
	B	10				8																						80	
	C	10				4																						40	
Technician Initials		SR																											

Animal Source: ABSDate Received: 11/26/02

Comments: 0 hrs: range finder test, and to 3rd instar @ initiation
 24 hrs: _____
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check: Bcs 12/02/02Final Review: QF 1/14/03

Chironomus tentans-96 Hr Survival

Start Date: 11/27/2002 Test ID: 0211-344 Sample ID: BEAZER
 End Date: 12/01/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: BMDSA - Benzene Metadisulfonic Acid
 Sample Date: Protocol: ASTM 94 Test Species: CT-Chironomus tentans
 Comments: Industrial product testing

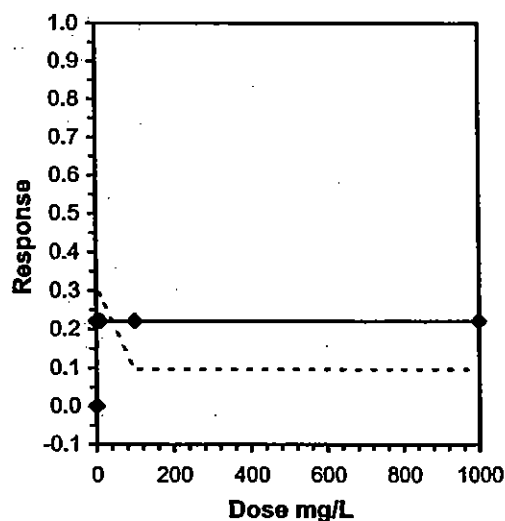
Conc-mg/L	1	2	3
L-Lab Control	0.7000	0.9000	0.5000
0.1	0.8000	0.6000	0.8000
1	0.2000	0.5000	0.7000
10	0.6000	0.4000	0.5000
100	0.4000	0.8000	0.7000
1000	0.7000	0.8000	0.4000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
L-Lab Control	0.7000	1.0000	1.0085	0.7854	1.2490	23.035	3				0.7167	1.0000
0.1	0.7333	1.0476	1.0335	0.8861	1.1071	12.350	3	-0.151	2.500	0.4136	0.7167	1.0000
1	0.4667	0.6667	0.7467	0.4636	0.9912	35.605	3	1.582	2.500	0.4136	0.5583	0.7791
10	0.5000	0.7143	0.7854	0.6847	0.8861	12.819	3	1.349	2.500	0.4136	0.5583	0.7791
100	0.6333	0.9048	0.9277	0.6847	1.1071	23.527	3	0.489	2.500	0.4136	0.5583	0.7791
1000	0.6333	0.9048	0.9277	0.6847	1.1071	23.527	3	0.489	2.500	0.4136	0.5583	0.7791

Auxiliary Tests					Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)					0.92717	0.858	-0.3251	-1.0547
Bartlett's Test indicates equal variances ($p = 0.85$)					2.02522	15.0863		
Hypothesis Test (1-tail, 0.05)					NOEC	LOEC	ChV	TU
Dunnett's Test					1000	>1000		
					0.40171	0.5612	0.04056	0.04106
							0.46442	5, 12

Linear Interpolation (200 Resamples)

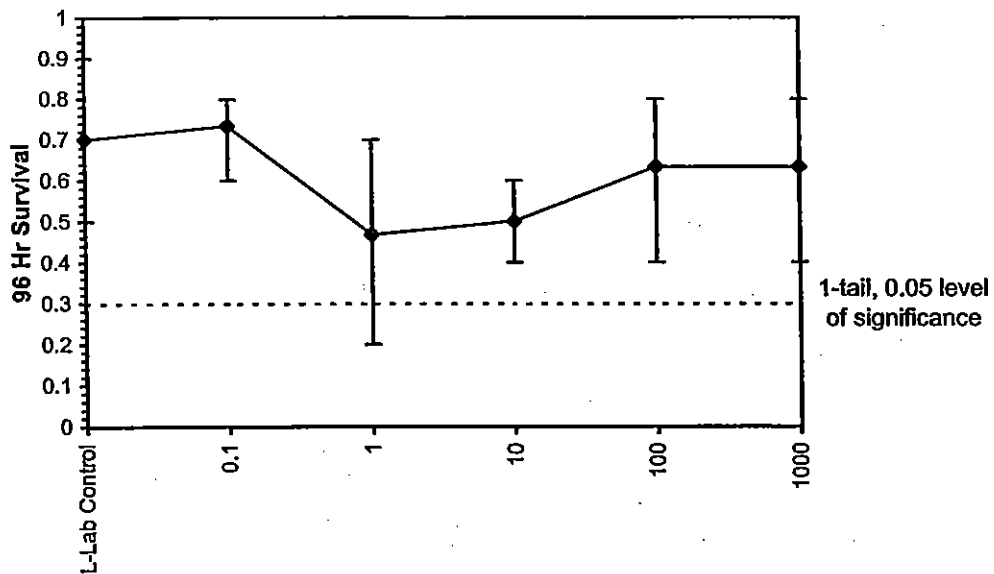
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	0.3037			
IC10	0.5074			
IC15	0.7111			
IC20	0.9147			
IC25	>1000			
IC40	>1000			
IC50	>1000			



Chironomus tentans-96 Hr Survival

Start Date: 11/27/2002 Test ID: 0211-344 Sample ID: BEAZER
End Date: 12/01/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: BMDSA - Benzene Metadisulfonic Acid
Sample Date: Protocol: ASTM 94 Test Species: CT-Chironomus tentans
Comments: Industrial product testing

Dose-Response Plot



Client: Beaver
 Sample ID: BMSA
 Contact: _____
 Test #: 0211-345

Start Date & Time: 11/27/02 1400
 End Date & Time: 12-1-02 1400
 Test Organism: C. tentans
 Test Protocol: ASTM 1994, EPA 0015 1996

Concentration mg/L	Rep	Number of Live Organisms					D.O. (mg/L)					pH (pH units)					Conductivity (µmhos-cm)				Test Temperature (°C)					% Surv.			
							Init.	Fin.	Init.	Fin.	Init.	Fin.	Init.	Fin.	Init.	Fin.	Init.	Fin.	Init.	Fin.									
		0	24	48	72	96	0	24	48	48	72	96	0	24	48	48	72	96	0	48	48	96	0	24	48		48	72	96
Lab Cont.	A	10				4	8.2	8.2	8.3		8.3	8.5	8.24	7.92	7.79		7.20	7.76	179	194		194	20.0	20.5	20.4		20.3	20.3	40
	B	10				6																						60	
	C	10				5																						50	
0.1	A	10				4	8.2	8.4	8.4		8.6	8.6	8.22	7.94	7.82		7.84	7.82	179	189		144	20.0	20.3	20.3		20.3	20.2	40
	B	10				5																						50	
	C	10				5																						50	
1.0	A	10				3	8.1	8.2	8.1		8.5	8.3	8.19	7.96	7.82		7.83	7.81	180	188		191	20.0	20.3	20.3		20.1	20.2	30
	B	10				5																						50	
	C	10				7																						70	
10	A	10				5	8.1	8.3	8.4		8.7	8.5	8.23	7.96	7.84		7.86	7.82	181	192		195	20.0	20.3	20.2		20.1	20.2	50
	B	10				8																						80	
	C	10				6																						60	
100	A	10				6	8.1	8.4	8.4		8.6	8.4	8.24	7.97	7.87		7.88	7.91	218	226		229	20.0	20.2	20.2		20.1	20.1	60
	B	10				7																						70	
	C	10				5																						50	
1000	A	10				7	8.3	8.4	8.4		8.8	8.6	8.29	8.02	7.96		7.96	7.91	550	557		559	20.0	20.2	20.1		20.0	20.0	70
	B	10				4																						40	
	C	10				5																						50	
Technician Initials		JK					BR																						

Animal Source: ABSDate Received: 11/26/02

Comments: 0 hrs: range finder test, 2nd to 3rd instar @ initiation
 24 hrs: _____
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check: BCS 12/02/02Final Review: JP 1/4/03

Chironomus tentans-96 Hr Survival

Start Date: 11/27/2002 Test ID: 0211-345 Sample ID: BEAZER
 End Date: 12/01/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: BMDSA - Benzene Monosulfonic Acid
 Sample Date: Protocol: ASTM 94 Test Species: CT-Chironomus tentans
 Comments: Industrial product testing

Conc-mg/L	1	2	3
L-Lab Control	0.7000	0.9000	0.5000
0.1	0.4000	0.5000	0.5000
1	0.3000	0.5000	0.7000
10	0.5000	0.8000	0.6000
100	0.6000	0.7000	0.5000
1000	0.4000	0.7000	0.5000

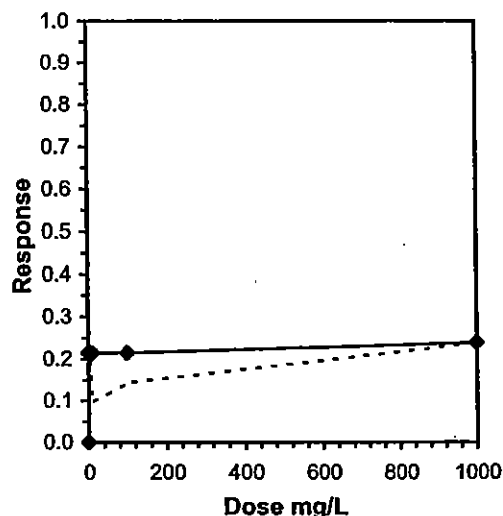
Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed		Isotonic	
			Mean	Min	Max	CV%	N		Critical	MSD	Mean	N-Mean
L-Lab Control	0.7000	1.0000	1.0085	0.7854	1.2490	23.035	3				0.7000	1.0000
0.1	0.4667	0.6667	0.7518	0.6847	0.7854	7.731	3	1.915	2.500	0.3352	0.5500	0.7857
1	0.5000	0.7143	0.7854	0.5796	0.9912	26.198	3	1.664	2.500	0.3352	0.5500	0.7857
10	0.6333	0.9048	0.9262	0.7854	1.1071	17.770	3	0.614	2.500	0.3352	0.5500	0.7857
100	0.6000	0.8571	0.8875	0.7854	0.9912	11.592	3	0.902	2.500	0.3352	0.5500	0.7857
1000	0.5333	0.7619	0.8204	0.6847	0.9912	19.038	3	1.403	2.500	0.3352	0.5333	0.7619

Auxiliary Tests					Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.96084	0.858	0.20468	-0.762						
Bartlett's Test indicates equal variances (p = 0.66)					3.28406	15.0863								
Hypothesis Test (1-tail, 0.05)					NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test					1000	>1000			0.32689	0.45667	0.02758	0.02696	0.44655	5, 12

Linear Interpolation (200 Resamples)				
Point	mg/L	SD	95% CL(Exp)	Skew

IC05*	0.0233
IC10*	0.0467
IC15*	0.0700
IC20*	0.0933
IC25	>1000
IC40	>1000
IC50	>1000

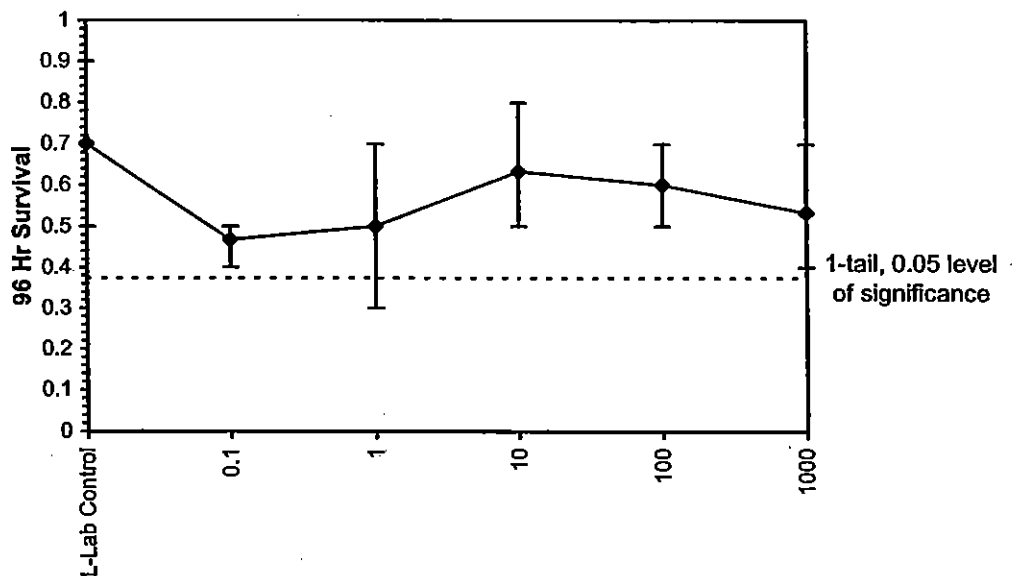
* indicates IC estimate less than the lowest concentration



Chironomus tentans-96 Hr Survival

Start Date: 11/27/2002	Test ID: 0211-345	Sample ID: BEAZER
End Date: 12/01/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: BMDSA - Benzene Monosulfonic Acid
Sample Date:	Protocol: ASTM 94	Test Species: CT-Chironomus tentans
Comments: Industrial product testing		

Dose-Response Plot



Client: Begz
 Sample ID: PSA
 Contact: _____
 Test #: 1211-343

Start Date & Time: 11/27/02 1530
 End Date & Time: 12/1/02 1445
 Test Organism: C. tentans
 Test Protocol: MTM 1994, EPA OPPTS 1996

Concentration mg/L	Rep	Number of Live Organisms					D.O. (mg/L)					pH (pH units)					Conductivity (µmhos-cm)				Test Temperature (°C)					% Surv.			
							Init.		Fin.			Init.		Fin.			Init.		Fin.		Init.		Fin.						
		0	24	48	72	96	0	24	48	48	72	96	0	24	48	48	72	96	0	48	48	96	0	24	48		48	72	96
Lab Cont.	A	10				7	8.1	8.4	8.4		8.8	8.7	8.04	7.96	7.85		7.86	7.84	178	202	20	202	20.0	20.5	20.4		20.3	20.4	70
	B	10				9																						90	
	C	10				5																						50	
0.1	A	10				6	8.0	8.4	8.4		8.7	8.5	8.04	7.96	7.86		7.88	7.87	179	196		199	20.0	20.4	20.4		20.3	20.3	60
	B	10				4																						40	
	C	10				6																						60	
1.0	A	10				3	8.0	8.5	8.4		8.7	8.6	8.03	7.98	7.85		7.91	7.86	179	191		194	20.0	20.3	20.3		20.1	20.3	30
	B	10				2																						20	
	C	10				3																						30	
10	A	10				5	8.0	8.5	8.4		8.6	8.5	8.01	7.99	7.89		7.90	7.86	180	188		191	20.0	20.3	20.3		20.1	20.2	50
	B	10				6																						60	
	C	10				4																						40	
100	A	10				3	8.0	8.5	8.2		8.6	8.2	7.83	7.98	7.84		7.90	7.82	208	227		229	20.0	20.3	20.2		20.1	20.2	30
	B	10				3																						50	
	C	10				5																						50	
1000	A	10				3	8.1	8.4	8.4		8.7	8.3	7.43	7.93	7.83		7.90	7.85	454	461		465	20.0	20.3	20.2		20.1	20.2	30
	B	10				7																						70	
	C	10				4																						40	
Technician Initials		JRL					PL																						

Animal Source: ABSDate Received: 11/26/02

Comments: 0 hrs: range finder test, and to 3rd instar @ initiation
 24 hrs: _____
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

QA Check: BCS 12/6/02Final Review: 1/14/03

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

Chironomus tentans-96 Hr Survival

Start Date: 11/27/2002 Test ID: 0211-343 Sample ID: BEAZER
 End Date: 12/01/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: PSA - P-Phenol Sulfonic Acid
 Sample Date: Protocol: ASTM 94 Test Species: CT-Chironomus tentans
 Comments: Industrial product testing

Conc-mg/L	1	2	3
L-Lab Control	0.7000	0.9000	0.5000
0.1	0.6000	0.4000	0.6000
1	0.3000	0.2000	0.3000
10	0.5000	0.6000	0.4000
100	0.3000	0.5000	0.5000
1000	0.3000	0.7000	0.4000

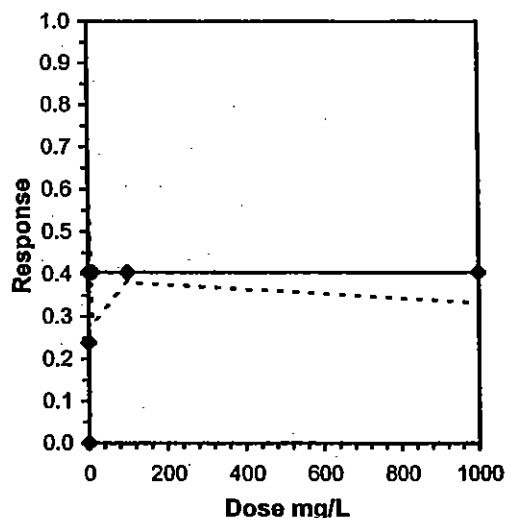
Conc-mg/L	Transform: Arcsin Square Root							1-Tailed		MSD	Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical		Mean	N-Mean
L-Lab Control	0.7000	1.0000	1.0085	0.7854	1.2490	23.035	3				0.7000	1.0000
0.1	0.5333	0.7619	0.8190	0.6847	0.8861	14.195	3	1.510	2.500	0.3139	0.5333	0.7619
*1	0.2667	0.3810	0.5410	0.4636	0.5796	12.379	3	3.723	2.500	0.3139	0.4167	0.5952
10	0.5000	0.7143	0.7854	0.6847	0.8861	12.819	3	1.777	2.500	0.3139	0.4167	0.5952
100	0.4333	0.6190	0.7168	0.5796	0.7854	16.573	3	2.323	2.500	0.3139	0.4167	0.5952
1000	0.4667	0.6667	0.7518	0.5796	0.9912	28.438	3	2.044	2.500	0.3139	0.4167	0.5952

Auxillary Tests					Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.95638	0.858	0.21465	-0.3012						
Bartlett's Test indicates equal variances (p = 0.62)					3.52142	15.0863								
Hypothesis Test (1-tail, 0.05)					NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test					0.1	1	0.31623		0.30612	0.42766	0.08909	0.02366	0.05952	5, 12

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05*	0.0210	0.0726	0.0008 0.5615	3.5386
IC10*	0.0420	0.1481	0.0015 0.9429	2.3283
IC15*	0.0630			
IC20*	0.0840			
IC25	0.1643			
IC40	0.9743			
IC50	>1000			

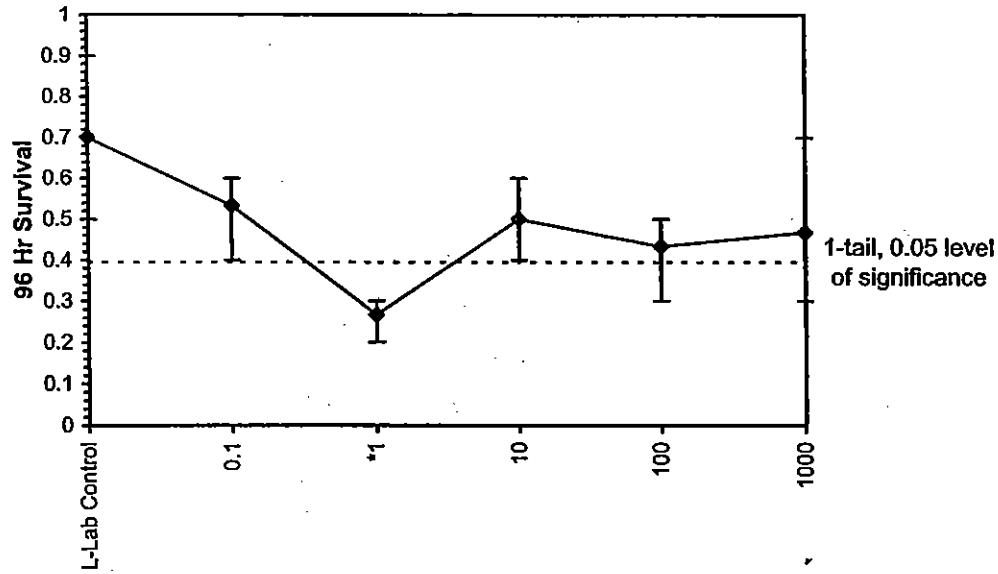
* indicates IC estimate less than the lowest concentration



Chironomus tentans-96 Hr Survival

Start Date: 11/27/2002	Test ID: 0211-343	Sample ID: BEAZER
End Date: 12/01/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: PSA - P-Phenol Sulfonic Acid
Sample Date:	Protocol: ASTM 94	Test Species: CT-Chironomus tentans
Comments: Industrial product testing		

Dose-Response Plot



Client: B&B
 Sample ID: RES
 Contact: _____
 Test #: 0211-346

Start Date & Time: 11/27/02
 End Date & Time: 12/1/02 1415
 Test Organism: C. tentans
 Test Protocol: ASTM 1924, EDA OPPTS 1996

Concentration mg/L	Rep	Number of Live Organisms					D.O. (mg/L)					pH (pH units)					Conductivity (µmhos-cm)				Test Temperature (°C)						% Surv.		
									Init.	Fin.					Init.	Fin.					Init.	Fin.				Init.		Fin.	
		0	24	48	72	96	0	24	48	48	72	96	0	24	48	48	72	96	0	48	48	96	0	24	48	48		72	96
Lab control	A	10				3	8.4	8.4	8.4		8.7	8.7	8.04	7.92	7.89		7.91	7.86	188	192		194	20.5	20.3	20.3		20.3	20.2	30
	B	10				6																						60	
	C	10				5																						50	
0.1	A	10				6	8.3	8.3	8.3		8.1	8.1	8.08	7.94	7.86		7.89	7.83	188	187		190	20.5	20.2	20.2		20.3	20.2	60
	B	10				8																						80	
	C	10				5																						50	
1.0	A	10				9	8.3	8.0	8.1		8.3	8.4	8.11	7.93	7.85		7.88	7.84	185	187		189	20.5	20.2	20.1		20.3	20.0	96
	B	10				7																						70	
	C	10				6																						60	
10	A	10				5	8.3	7.8	5.1		7.4	8.1	8.09	7.91	7.44		7.72	7.79	188	189		194	20.5	20.2	20.2		20.1	20.0	50
	B	10				7																						70	
	C	10				5																						50	
100	A	10				6	8.3	8.3	6.0		4.9	6.1	7.90	7.96	7.49		7.40	7.35	186	190		193	20.5	20.2	20.2		20.3	20.1	60
	B	10				5																						50	
	C	10				2																						20	
1000	A	10				0	8.5	8.7	8.2		7.8	7.8	7.42	7.87	7.80		7.81	7.72	167	145		178	20.5	20.2	20.2		20.3	20.2	0
	B	10				0																						0	
	C	10				0																						0	
Technician Initials						RB																							

Animal Source: ABSDate Received: 11/26/02

Comments: 0 hrs: range finder test, and to 2nd instar @ initiation
 24 hrs: _____
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check: BGS 12/02/02Final Review: 11/14/03

Chironomus tentans-96 Hr Survival

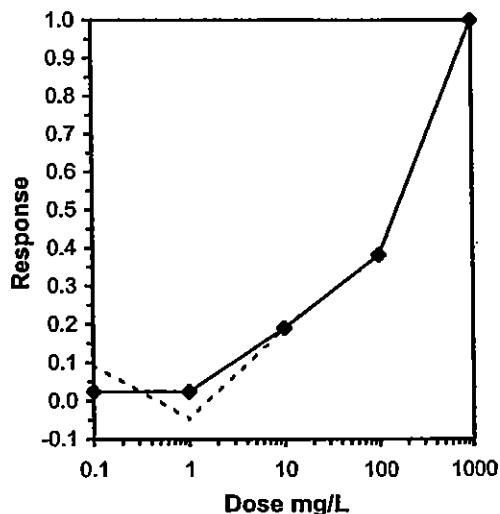
Start Date: 11/27/2002 Test ID: 0211-346 Sample ID: BEAZER
 End Date: 12/01/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: RES - Resorcinol
 Sample Date: Protocol: ASTM 94 Test Species: CT-Chironomus tentans
 Comments: Industrial product testing

Conc-mg/L	1	2	3
L-Lab Control	0.7000	0.9000	0.5000
0.1	0.6000	0.8000	0.5000
1	0.9000	0.7000	0.6000
10	0.5000	0.7000	0.5000
100	0.6000	0.5000	0.2000
1000	0.0000	0.0000	0.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed Critical	MSD	Number Resp	Total Number
			Mean	Min	Max	CV%	N					
L-Lab Control	0.7000	1.0000	1.0085	0.7854	1.2490	23.035	3				9	30
0.1	0.6333	0.9048	0.9262	0.7854	1.1071	17.770	3	0.584	2.500	0.3523	11	30
1	0.7333	1.0476	1.0421	0.8861	1.2490	17.922	3	-0.238	2.500	0.3523	8	30
10	0.5667	0.8095	0.8540	0.7854	0.9912	13.911	3	1.097	2.500	0.3523	13	30
100	0.4333	0.6190	0.7117	0.4636	0.8861	31.002	3	2.106	2.500	0.3523	17	30
*1000	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	3	6.030	2.500	0.3523	30	30

Auxillary Tests					Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.95655	0.858	0.06885	-0.7945						
Equality of variance cannot be confirmed														
Hypothesis Test (1-tail, 0.05)					NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test					100	1000	316.228		0.34355	0.47994	0.32296	0.02979	4.0E-04	5, 12

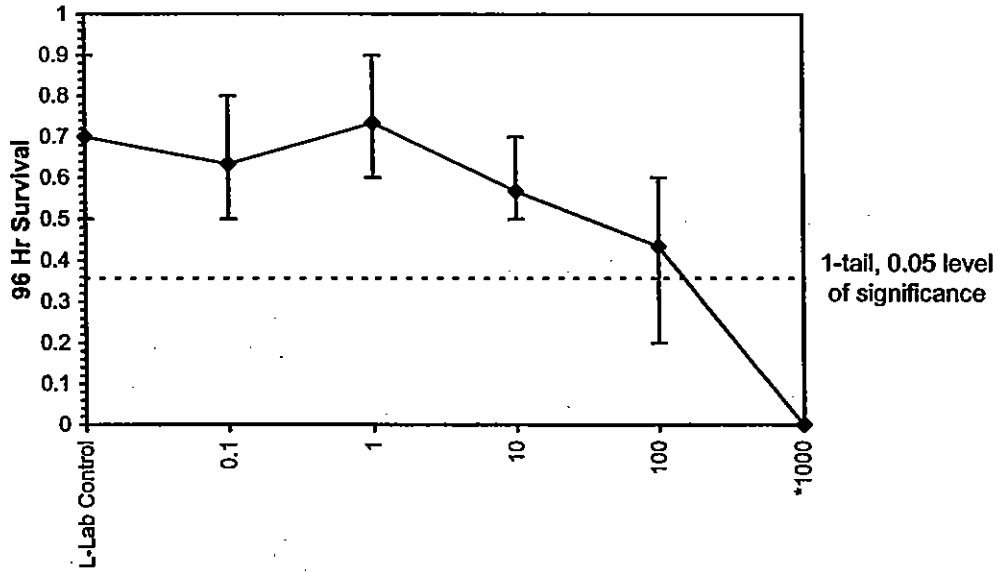
Trimmed Spearman-Kärber				
Trim Level	EC50	95% CL		
0.0%				
5.0%	91.82	51.32	164.26	
10.0%	102.13	54.66	190.85	
20.0%	123.92	62.03	247.53	
Auto-2.4%	86.69	49.76	151.04	



Chironomus tentans-96 Hr Survival

Start Date: 11/27/2002	Test ID: 0211-346	Sample ID: BEAZER
End Date: 12/01/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: RES - Resorcinol
Sample Date:	Protocol: ASTM 94	Test Species: CT-Chironomus tentans
Comments: Industrial product testing		

Dose-Response Plot



Oncorhynchus mykiss

Freshwater Acute

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Amec-Berzer Ramsefnder
 Sample ID: BMDSA
 Contact: Bill Alap
 Test #: 0301-104

Start Date & Time: 1/29/03 1600
 End Date & Time: 2-2-03 1210
 Test Organism: O. mykiss
 Test Protocol: EPA 1993

Concentration mg/L	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (umhos-cm)					Temperature (°C)					Perc. Surv.
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
LC	A	5	5	5	5	5	9.6	6.4	10.0	7.2	7.1	8.09	7.44	7.38	7.36	7.36	186	162	157	160	163	17.0	13.7	13.0	13.3	13.1	100
	B	5	5	5	5	5																					100
	C	5	5	5	5	5																					100
	D	5	5	5	5	5																					100
10	A	5	5	5	5	5	9.5	6.6	9.5	7.1	6.8	8.12	7.49	7.41	7.36	7.28	191	167	194	164	166	17.0	13.7	13.1	13.2	12.9	100
	B	5	5	5	5	5																					100
	C	5	5	5	5	5																					100
	D	5	5	5	5	5																					100
100	A	5	5	5	5	5	9.5	6.6	9.7	7.4	7.6	8.17	7.53	7.48	7.40	7.38	242	212	245	206	207	17.0	13.7	13.0	13.1	12.7	100
	B	5	5	5	5	5																					100
	C	5	5	5	5	5																					100
	D	5	5	5	5	5																					100
Technician Initials		SH	MD	JK	SH	DA																					

Animal Source: ThomasDate Received: 1/28/03

Comments: 0 hrs: _____
 24 hrs: _____
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check: [Signature] 2/9/03Final Review: BCS 2/16/03

Freshwater Acute

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Amec-Beazer Ramsefnder
 Sample ID: BMDSA
 Contact: Bill Alsop
 Test #: 0301-104

Start Date & Time: 1/29/03 1600
 End Date & Time: 2-2-03 1210
 Test Organism: O. mykiss
 Test Protocol: EPA 1993

Concentration mg/L	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Perc. Surv.			
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96				
500	A	5	5	5	5	5	9.2	6.7	9.6	7.3	7.0	8.26	7.62	7.86	7.45	7.47	465	400	465	385	382	13.0	13.7	13.0	13.1	12.6	100			
	B	5	5	5	5	5																				100				
	C	5	5	5	5	5																				100				
	D	5	5	5	5	5																				100				
1000	A	5	5	5	5	5	9.5	6.6	10.0	7.7	7.2	8.30	7.60	7.60	7.52	7.57	750	645	746	619	615	13.0	13.6	13.0	13.0	12.6	100			
	B	5	5	5	5	5																				100				
	C	5	5	5	5	5																				100				
	D	5	5	5	5	5																				100				
5000	A	5	5	5	5	5	9.4	7.1	10.1	8.1	7.8	8.42	7.80	7.77	7.69	7.67	2830	2430	2810	2330	2700	13.0	13.5	12.9	13.0	12.5	100			
	B	5	5	5	5	5																				100				
	C	5	5	5	5	5																				100				
	D	5	5	5	5	5																				100				
Technician Initials		SH	MD	JR	SH	QR																								

Animal Source: ThomasDate Received: 1/28/03

Comments: 0 hrs: _____
 24 hrs: _____
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check: Li 2/9/03Final Review: BCS 2/10/03

Freshwater Acute

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Amec - Beazer Ramsefinder
 Sample ID: BMDSA
 Contact: Bill Alamp
 Test #: 0301-104

Start Date & Time: 1/29/03 1600
 End Date & Time: 2-2-03 1210
 Test Organism: O. mykiss
 Test Protocol: EPA 1993

Concentration <u>mg/L</u>	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Perc. Surv.
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
<u>10,000</u>	A	5	5	5	5	5	9.4	7.0	9.9	7.5	7.2	7.4	7.78	7.74	7.72	7.61	5240	4450	5280	4270	4250	13.0	13.3	12.8	12.9	12.5	100
	B	5	5	5	5	5																					100
	C	5	5	5	5	5																					100
	D	5	5	5	5	5																					100
	A																										
	B																										
	C																										
	D																										
	A																										
	B																										
	C																										
	D																										
Technician Initials		SH	MD	JR	SH	BR																					

Animal Source: ThomasDate Received: 1/28/03

Comments: 0 hrs: _____
 24 hrs: _____
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

QA Check:

[Signature] 2/4/03

Final Review: PCS 2/10/03

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

Acute Fish Test-96 Hr Survival

Start Date: 01/29/2003	Test ID: 0301-104	Sample ID: BEAZER
End Date: 02/02/2003	Lab ID:	Sample Type: OTH-Other sample type
Sample Date:	Protocol: EPAA 91-EPA Acute	Test Species: OM-Oncorhynchus mykiss
Comments: Chemical testing - BMDSA Rangefinder		

Conc-mg/L	1	2	3	4
L-Lab Control	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000
5000	1.0000	1.0000	1.0000	1.0000
10000	1.0000	1.0000	1.0000	1.0000

Conc-mg/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N			Mean	N-Mean
L-Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			1.0000	1.0000
10	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
100	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
1000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
5000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
10000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000

Auxiliary Tests

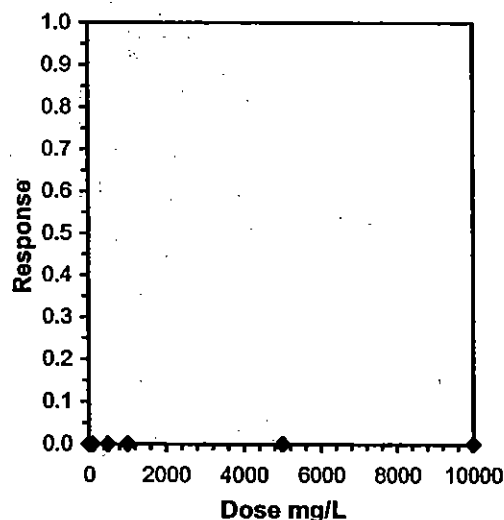
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)

Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	10000	>10000		

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Freshwater Acute

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Amec - Beazer Ramgetinder
 Sample ID: BMSA
 Contact: Bill Alsop
 Test #: 0301-103

Start Date & Time: 1/29/03 1600
 End Date & Time: 2-2-03 1210
 Test Organism: O. mykiss
 Test Protocol: EPA 1993

Concentration mg/L	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Perc. Surv.							
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96								
LC	A	5	5	5	5	5	9.6	6.5	10.2	7.7	8.0	8.10	7.56	7.40	7.39	7.07	185	162	188	160	163	15.2	13.8	13.0	13.4	13.1	100							
	B	5	5	5	5	5																				100								
	C	5	5	5	5	5																				100								
	D	5	5	5	5	5																				100								
10	A	5	5	5	5	5	9.6	6.7	10.2	7.5	7.9	8.17	7.56	7.41	7.40	7.16	189	164	192	161	162	15.6	13.6	13.0	13.1	12.7	100							
	B	5	5	5	5	5																				100								
	C	5	5	5	5	5																				100								
	D	5	5	5	5	5																				100								
100	A	5	5	5	5	5	9.6	6.8	10.4	7.7	7.8	8.19	7.57	7.49	7.42	7.23	223	193	225	189	189	15.5	13.6	13.0	13.1	12.6	100							
	B	5	5	5	5	5																				100								
	C	5	5	5	5	5																				100								
	D	5	5	5	5	5																				100								
Technician Initials		JH	MD	JR	SH	OR																												

Animal Source: ThomasDate Received: 1/28/03

Comments: 0 hrs: _____
 24 hrs: _____
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check: [Signature] 2/9/03Final Review: BOS 2/10/03

Freshwater Acute

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Amec-Bearer Ramsefnder
 Sample ID: BMSA
 Contact: Bill Alsop
 Test #: 0301-103

Start Date & Time: 1/29/03 1600
 End Date & Time: 2-2-03 1210
 Test Organism: O. mykiss
 Test Protocol: EPA 1443

Concentration mg/L	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Perc. Surv							
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96								
500	A	5	5	5	5	5	9.4	6.5	10.4	7.6	7.9	8.21	7.59	7.54	7.43	7.37	371	379	370	307	305	15.2	13.6	12.9	13.1	12.6	100							
	B	5	5	5	5	5																				100								
	C	5	5	5	5	5																				100								
	D	5	5	5	5	5																				100								
1000	A	5	5	5	5	5	9.6	6.6	10.5	7.9	8.0	8.22	7.60	7.59	7.44	7.45	546	467	542	451	449	15	13.5	12.8	13.1	12.5	100							
	B	5	5	5	5	5																				100								
	C	5	5	5	5	5																				100								
	D	5	5	5	5	5																				100								
5000	A	5	5	5	5	5	9.7	6.4	10.4	7.6	7.5	8.19	7.67	7.70	7.51	7.58	1483	1688	1402	1622	1598	13.0	13.4	12.9	13.0	12.5	100							
	B	5	5	5	5	5																				100								
	C	5	5	5	5	5																				100								
	D	5	5	5	5	5																				100								
Technician Initials		SH	MD	JR	SH	QR																												

Animal Source: ThomasDate Received: 1/28/03

Comments: 0 hrs: _____
 24 hrs: _____
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check:

Sh 2/9/03

Final Review: BCS 2/10/03

Freshwater Acute

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Amec-Beazer RangeFinder
 Sample ID: BMSA
 Contact: Bill Alsop
 Test #: 0301-103

Start Date & Time: 1/29/03 1600
 End Date & Time: 2-2-03 1210
 Test Organism: O. mykiss
 Test Protocol: EPA 1993

Concentration <u>mg/L</u>	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Perc. Surv.
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
<u>10,000</u>	A	5	5	5	5	5	9.2	6.4	10.2	7.7	7.4	6.2	7.68	7.69	7.51	7.60	3680	3130	3650	3000	2960	13.0	13.3	12.9	13.0	12.5	100
	B	5	5	5	5	5																					100
	C	5	5	5	5	5																					100
	D	5	5	5	5	5																					100
	A																										
	B																										
	C																										
	D																										
	A																										
	B																										
	C																										
	D																										
Technician Initials		SH	MD	JR	SH	BR																					

Animal Source: ThomasDate Received: 1/28/03

Comments: 0 hrs: _____
 24 hrs: _____
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check: [Signature] 2/9/03Final Review: BCS 2/10/03

Acute Fish Test-96 Hr Survival

Start Date: 01/29/2003	Test ID: 0301-103	Sample ID: BEAZER
End Date: 02/02/2003	Lab ID:	Sample Type: OTH-Other sample type
Sample Date:	Protocol: EPAA 91-EPA Acute	Test Species: OM-Oncorhynchus mykiss
Comments: Chemical testing - BMSA Rangefinder		

Conc-mg/L	1	2	3	4
L-Lab Control	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000
5000	1.0000	1.0000	1.0000	1.0000
10000	1.0000	1.0000	1.0000	1.0000

Conc-mg/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N			Mean	N-Mean
L-Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			1.0000	1.0000
10	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
100	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
1000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
5000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
10000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000

Auxiliary Tests

Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)

Statistic	Critical	Skew	Kurt
1	0.896		

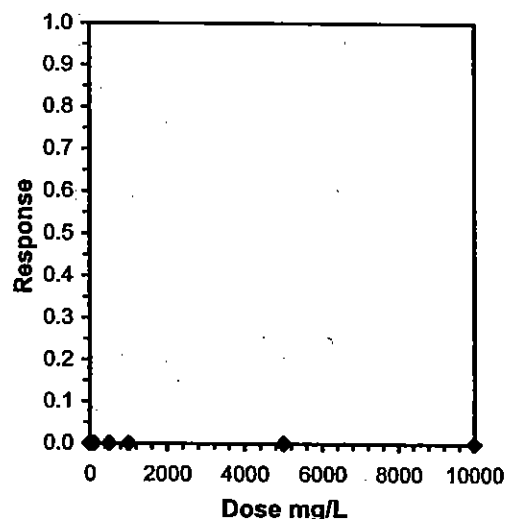
Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
---------------------------------------	-------------	-------------	------------	-----------

Steel's Many-One Rank Test	10000	>10000		
----------------------------	-------	--------	--	--

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Freshwater Acute

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Amec - Beaver Range Finder
 Sample ID: PSA
 Contact: Bill Alsop
 Test #: 0301-105

Start Date & Time: 1/29/03 1600
 End Date & Time: 1/29/03 1210
 Test Organism: O. mykiss
 Test Protocol: EPA 1993

Concentration mg/L	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Perc. Surv.							
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96								
LC	A	5	5	5	5	5	9.5	6.4	10.5	8.3	7.9	7.95	7.32	8.10	7.37	7.26	185	162	189	163	168	13.0	13.5	13.0	13.1	13.2	100							
	B	5	5	5	5	5																				100								
	C	5	5	5	5	5																				100								
	D	5	5	5	5	5																				100								
10	A	5	5	5	5	5	9.6	6.7	10.5	8.0	7.8	7.97	7.31	8.00	7.30	7.35	186	163	190	160	162	13.0	13.4	13.1	13.0	12.9	100							
	B	5	5	5	5	5																				100								
	C	5	5	5	5	5																				100								
	D	5	5	5	5	5																				100								
100	A	5	5	5	5	5	9.5	6.4	9.8	8.1	7.4	7.96	7.39	7.82	7.37	7.43	215	185	217	181	183	13.0	13.3	13.1	12.9	12.7	100							
	B	5	5	5	5	5																				100								
	C	5	5	5	5	5																				100								
	D	5	5	5	5	5																				100								
Technician Initials		JR	MD	JR	SH	DR																												

Animal Source:

Thomas

Date Received:

1/28/03

Comments:

0 hrs:

24 hrs:

48 hrs:

72 hrs:

96 hrs:

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check:

2/9/03

Final Review:

Bcs 2/16/03

Freshwater Acute

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: AmeC - Deazee Ramseyinder
 Sample ID: PSA
 Contact: Bill Alsup
 Test #: 0301-105

Start Date & Time: 1/29/03 1600
 End Date & Time: 2-2-03 1210
 Test Organism: O. mykiss
 Test Protocol: EPA 1993

Concentration mg/L	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Perc. Surv.
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
500	A	5	5	5	5	5	9.7	6.4	9.5	8.0	7.5	7.62	7.47	7.71	7.40	7.54	327	274	326	270	270	13.0	13.3	13.0	12.9	12.6	100
	B	5	5	5	5	5																					100
	C	5	5	5	5	5																					100
	D	5	5	5	5	5																					100
1000	A	5	5	5	5	5	9.5	6.6	10.0	8.2	7.7	7.53	7.47	7.67	7.43	7.54	450	383	400	373	372	13.0	13.2	13.0	12.9	12.5	100
	B	5	5	5	5	5																					100
	C	5	5	5	5	5																					100
	D	5	5	5	5	5																					100
5000	A	5	5	5	5	5	9.5	6.7	10.4	7.8	7.9	7.20	7.38	7.51	7.39	7.41	1542	1299	1536	1259	1244	13.0	13.1	12.9	12.7	12.4	100
	B	5	5	5	5	5																					100
	C	5	5	5	5	5																					100
	D	5	5	5	5	5																					100
Technician Initials		JR	MD	JR	SA	BR																					

Animal Source:

Thomas

Date Received:

1/28/03

Comments:

0 hrs:

24 hrs:

48 hrs:

72 hrs:

96 hrs:

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check:

[Signature]2/9/03

Final Review:

BC 2/10/03

Freshwater Acute

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Amec - Beaver Rametinder
 Sample ID: PSA
 Contact: Bill Alsup
 Test #: 0301-105

Start Date & Time: 1/29/03 1600
 End Date & Time: 2-2-03 1210
 Test Organism: O. mykiss
 Test Protocol: EPA 1993

Concentration <u>mg/L</u>	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Perc. Surv.
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
10,000	A	5	5	5	5	5	9.5	6.7	9.4	7.5	7.5	7.02	7.22	7.27	7.26	7.23	2740	2360	2270	2290	2270	13.0	13.1	13.0	12.7	12.4	100
	B	5	5	5	5	5																					100
	C	5	5	5	5	5																					100
	D	5	5	5	5	5																					100
	A																										
	B																										
	C																										
	D																										
	A																										
	B																										
	C																										
	D																										
Technician Initials		JR	MD	JR	SA	BR																					

Animal Source: ThomasDate Received: 1/28/03

Comments: 0 hrs: _____
 24 hrs: _____
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

QA Check: [Signature] 2/9/03Final Review: BCS 2/10/03

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

Acute Fish Test-96 Hr Survival

Start Date: 01/29/2003	Test ID: 0301-105	Sample ID: BEAZER
End Date: 02/02/2003	Lab ID:	Sample Type: OTH-Other sample type
Sample Date:	Protocol: EPAA 91-EPA Acute	Test Species: OM-Oncorhynchus mykiss
Comments: Chemical testing - PSA Rangefinder		

Conc-mg/L	1	2	3	4
L-Lab Control	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000
5000	1.0000	1.0000	1.0000	1.0000
10000	1.0000	1.0000	1.0000	1.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%	N			Mean	N-Mean
L-Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			1.0000	1.0000
10	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
100	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
1000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
5000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
10000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000

Auxiliary Tests

Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)

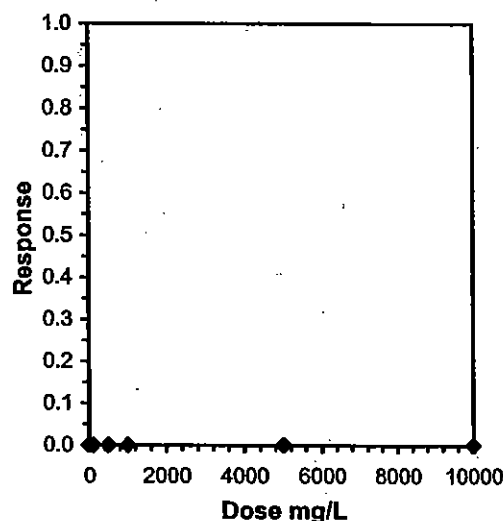
Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05) NOEC LOEC ChV TU

Steel's Many-One Rank Test 10000 >10000

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Lepomis macrochirus

Freshwater Acute

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: AMEC/Beazer
 Sample ID: BMDSA
 Contact: Bill Alsop
 Test #: 0304-177

Start Date & Time: 4/23/03 14:30
 End Date & Time: 4/27/03 1430
 Test Organism: L. macrochirus
 Test Protocol: ASTM E1241-98

Concentration mg/L	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Perc. Surv.							
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96								
Lab Control	A	5	5	5	5	5	9.1	3.9	7.6	7.1	8.0	8.23	7.49	7.99	7.86	7.86	856	769	773	787	905	20.9	20.4	20.2	20.3	20.3	100							
	B	5	5	5	5	5																				100								
10	A	5	5	5	5	5	9.1	2.8	7.4	7.9	8.4	8.22	7.50	7.96	7.96	7.93	861	774	776	790	904	20.9	20.4	20.0	20.1	20.1	100							
	B	5	5	5	5	5																				100								
100	A	5	5	5	5	5	9.0	3.4	7.2	7.4	7.5	8.22	7.53	7.93	7.91	7.84	919	824	826	838	958	20.9	20.4	20.1	20.0	20.0	100							
	B	5	5	5	5	5																				100								
500	A	5	5	5	5	5	9.0	3.6	6.2	7.2	7.5	8.22	7.53	7.81	7.86	7.83	1158	1035	1043	1053	1205	21.0	20.4	20.2	20.2	20.1	100							
	B	5	5	5	5	5																				100								
1,000	A	5	5	5	5	5	9.0	4.2	6.7	7.7	8.1	8.25	7.56	7.86	7.95	7.93	1457	1304	1311	1331	1526	20.9	20.3	20.0	20.2	20.1	100							
	B	5	5	5	5	5																				100								
5,000	A	5	5	5	5	5	9.1	3.8	5.4	8.9	9.2	8.29	7.60	7.68	8.16	8.14	3700	3280	3280	3310	3760	20.8	20.4	20.0	20.0	20.1	100							
	B	5	5	5	5	5																				100								
10,000	A	5	5	5	5	5	9.2	3.6	5.7	7.8	7.6	8.30	7.61	7.75	7.89	7.85	6330	5610	5630	5650	6400	20.7	20.4	20.0	20.2	20.1	100							
	B	5	5	5	5	5																				100								
Technician Initials		SH	PL	SH	SH	MO																												

Animal Source: OsageDate Received: 4/22/03

Comments: 0 hrs: range-finder
 24 hrs: Aerated Test
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check: JR 5/22/03Final Review: JR 6/2/03

Acute Fish Test-96 Hr Survival

Start Date: 04/23/2003	Test ID: 0304-178	Sample ID: BEAZER
End Date: 04/27/2003	Lab ID:	Sample Type: OTH-Other sample type
Sample Date:	Protocol: ASTM E1241	Test Species: LM-Lepomis macrochirus
Comments: Chemical testing - BMSA Rangefinder		

Conc-mg/L	1	2
L-Lab Control	1.0000	1.0000
10	1.0000	1.0000
100	1.0000	1.0000
500	1.0000	1.0000
1000	1.0000	1.0000
5000	1.0000	1.0000
10000	1.0000	1.0000

Conc-mg/L	Transform: Arcsin Square Root						N	Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%		Mean	N-Mean
L-Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
10	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
100	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
1000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
5000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
10000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000

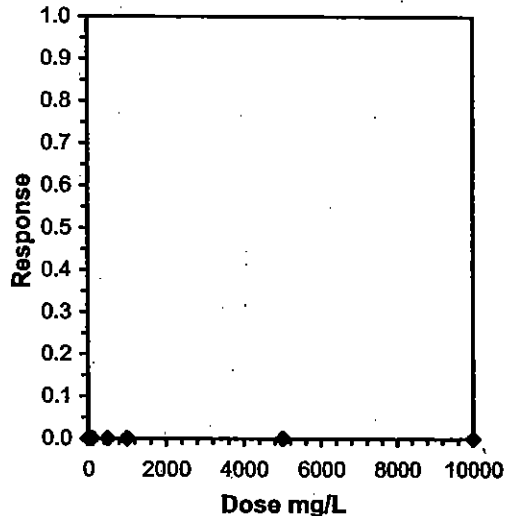
Auxiliary Tests

Normality of the data set cannot be confirmed

Equality of variance cannot be confirmed

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Freshwater Acute

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: AMEC/Beazer
 Sample ID: PSA
 Contact: Bill Alsop
 Test #: 0304-179

Start Date & Time: 4/23/03 15:05
 End Date & Time: 4/27/03 1430
 Test Organism: *L. macrochirus*
 Test Protocol: ASTM E1241-98

Concentration mg/L	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Perc. Surv.							
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96								
Lab Control	A	5	5	5	5	5	8.9	4.4	7.1	8.0	8.5	8.27	7.57	7.85	7.89	7.91	856	769	773	780	897	20.9	20.5	20.3	20.4	20.1	100							
	B	5	5	5	5	5																				100								
10	A	5	5	5	5	5	8.9	4.1	6.0	7.0	7.9	8.23	7.56	7.75	7.79	7.86	860	777	777	785	895	20.9	20.5	20.2	20.2	20.3	100							
	B	5	5	5	5	5																				100								
100	A	5	5	5	5	5	8.9	2.7	6.2	7.4	8.4	8.04	7.53	7.84	7.88	7.95	887	794	799	807	925	20.9	20.5	20.0	20.1	20.1	100							
	B	5	5	5	5	5																				100								
500	A	5	5	5	5	5	8.9	3.0	7.6	8.6	7.9	7.72	7.61	7.48	8.05	7.46	1009	899	912	924	1054	20.8	20.5	20.0	20.0	20.0	100							
	B	5	5	5	5	5																				100								
1,000	A	5	5	5	5	5	8.9	4.6	6.6	7.7	7.8	7.54	7.53	7.81	7.88	7.86	1163	1024	1032	1042	1162	20.8	20.5	20.2	20.2	20.3	100							
	B	5	5	5	5	5																				100								
5,000	A	5	5	5	5	5	8.9	4.2	7.2	8.4	8.4	7.08	7.42	7.62	7.72	7.72	2290	2040	2050	2070	2340	20.4	20.4	20.2	20.3	20.3	100							
	B	5	5	5	5	6																				100								
10,000	A	5	5	5	5	5	9.0	3.4	7.2	8.4	8.4	6.88	7.20	7.40	7.47	7.47	3630	3210	3230	3240	3680	19.9	20.5	20.0	20.2	20.1	100							
	B	5	5	5	5	5																				100								
Technician Initials		SH	RG	SH	SH	MD																												

Animal Source: OsageDate Received: 4/22/03

Comments: 0 hrs: range-finder
 24 hrs: Aerated Test
 48 hrs: _____
 72 hrs: _____
 96 hrs: _____

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

QA Check: JK 5/22/03Final Review: JK 6/2/03

Acute Fish Test-96 Hr Survival

Start Date: 04/23/2003	Test ID: 0304-179	Sample ID: BEAZER
End Date: 04/27/2003	Lab ID:	Sample Type: OTH-Other sample type
Sample Date:	Protocol: ASTM E1241	Test Species: LM-Lepomis macrochirus
Comments: Chemical testing - PSA Rangefinder		

Conc-mg/L	1	2
L-Lab Control	1.0000	1.0000
10	1.0000	1.0000
100	1.0000	1.0000
500	1.0000	1.0000
1000	1.0000	1.0000
5000	1.0000	1.0000
10000	1.0000	1.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					Isotonic	
			Mean	Min	Max	CV%	N	Mean	N-Mean
L-Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
10	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
100	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
1000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
5000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
10000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000

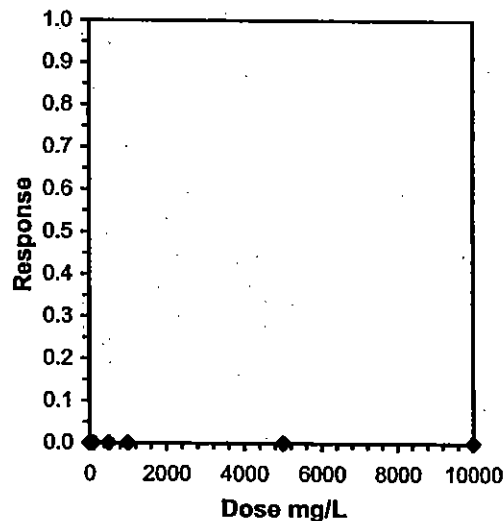
Auxiliary Tests

Normality of the data set cannot be confirmed
 Equality of variance cannot be confirmed

Statistic	Critical	Skew	Kurt
------------------	-----------------	-------------	-------------

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Brachionus calyciflorus

AMEC Earth & Environmental
Northwest Bioassay Lab
3009 Pacific Hwy. E., Suite 2
Belle, WA 98424

Rotifer Rapid Screen Test 24 Hour Acute Test Data Sheet

Range finder - 3 reps

Client: Beazer
Sample ID: BMDSA
Test #: 0304-14NW

Start Date & Time: 4/8/03 1210
End Date & Time: 4/9/03 1125
Test Organism: Brachionus calyciflorus

Conc. or mg/L	DO (mg/L)		pH (units)		Conductivity (µS/cm)		Temperature (°C)		Alkalinity (mg/L as CaCO ₃)	Hardness (mg/L)	Chlorine (mg/L)
0	0	24	0	24	0	24	0	24			
0	7.8	7.8	7.91	7.92	304	329	25.0	24.4	60	80	—
10	8.0	7.8	7.99	8.04	303	328	25.0	24.7			
100	7.9	7.2	8.00	8.03	360	361	25.0	24.9			
500	7.9	7.4	8.02	8.03	609	490	25.0	24.9			
1000	8.0	7.0	8.02	8.03	911	699	25.0	24.9			
5000	7.9	7.1	8.03	8.02	3060	1840	25.0	24.5			
10,000	8.0	7.2	8.02	8.04	5480	5920	25.0	24.3	60	80	—

Conc. or mg/L	Rep #	Cont. #	rotifer #		% Survival	Conc. or %	Rep #	Cont. #	rotifer #		% Survival
			0	24					0	24	
0	1	1	5	5	100	1000	1	25	5	5	100
	2	2	5	5			2	26	5	5	
	3	3	5	5			3	27	5	5	
	4	4	5				4	28	5		
	5	5	5				5	29	5		
	6	6	5				6	30	5		
10	1	7	5	5	100	5000	1	31	5	2	53
	2	8	5	5			2	32	5	3	
	3	9	5	5			3	33	5	3	
	4	10	5				4	34	5		
	5	11	5				5	35	5		
	6	12	5				6	36	5		
100	1	13	5	5	100	10,000	2	37	5	1	7
	2	14	5	5			3	38	5	6	
	3	15	5	5			4	39	5	0	
	4	16	5				5	40	5		
	5	17	5				6	41	5		
	6	18	5				1	42	5		
500	1	19	5	5	100		1	43	5		
	2	20	5	5			2	44	5		
	3	21	5	5			3	45	5		
	4	22	5				4	46	5		
	5	23	5				5	47	5		
	6	24	5				6	48	5		
Analyst			mw			Analyst			mw		

Comments:

Analysts: MB, mw

Rotifer Test-24 Hr Survival

Start Date: 4/8/03 Test ID: 0304-14NW Sample ID: BEAZER
End Date: 4/9/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: BMDSA-benzene metadisulfonic acid
Sample Date: 4/8/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus
Comments: range finding test

Conc-mg/L	1	2	3
D-Control	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000
5000	0.4000	0.6000	0.6000
10000	0.2000	0.0000	0.0000

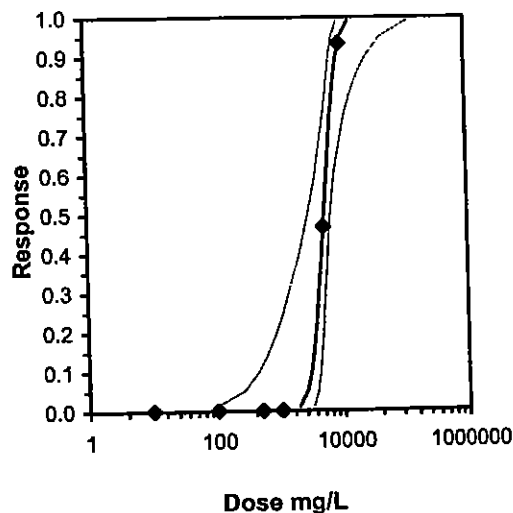
Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed Critical	MSD	Number Resp	Total Number
			Mean	Min	Max	CV%	N					
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3				0	15
10	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3	0.000	2.530	0.1406	0	15
100	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3	0.000	2.530	0.1406	0	15
500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3	0.000	2.530	0.1406	0	15
1000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3	0.000	2.530	0.1406	0	15
*5000	0.5333	0.5333	0.8190	0.6847	0.8861	14.195	3	9.472	2.530	0.1406	7	15
*10000	0.0667	0.0667	0.3049	0.2255	0.4636	45.094	3	18.724	2.530	0.1406	14	15

Auxiliary Tests					Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)					0.74966	0.873	0.3553	3.43217		
Equality of variance cannot be confirmed										
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	1000	5000	2236.07		0.07814	0.08225	0.50439	0.00463	6.2E-11	6, 14

Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits	Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter	
Slope	5.27918	1.93155	1.49335 9.06502	0	0.00126	9.48773	1	3.71513	0.18942	3	
Intercept	-14.613	7.32011	-28.96 -0.2655								

Point	Probits	mg/L	95% Fiducial Limits
EC01	2.674	1881.35	91.4216 3178.94
EC05	3.355	2532.56	258.772 3818.96
EC10	3.718	2967.41	449.145 4225.06
EC15	3.964	3302.24	650.033 4533.8
EC20	4.158	3595.1	870.188 4805.39
EC25	4.326	3866.96	1115.13 5062.56
EC40	4.747	4646.69	2048.08 5872.43
EC50	5.000	5189.6	2879.7 6582.89
EC60	5.253	5795.93	3879.12 7702.44
EC75	5.674	6964.62	5438.56 11704.4
EC80	5.842	7491.28	5932.58 14485.8
EC85	6.036	8155.64	6447.41 18912.3
EC90	6.282	9075.89	7047.33 26871
EC95	6.645	10634.3	7910.81 45966.8
EC99	7.326	14315.2	9614.88 128604

Significant heterogeneity detected ($p < 0.01$)



AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Rotifer Rapid Screen Test 24 Hour Acute Test Data Sheet

Range finder - 3 reps

Client: Beazer
Sample ID: BMSA
Test #: 0304-15NW

Start Date & Time: 4/8/03 1200
End Date & Time: 4/9/03 1100
Test Organism: Brachionus calyciflorus

Conc. or mg/L	DO (mg/L)		pH (units)		Conductivity (µS/cm)		Temperature (°C)		Alkalinity (mg/L as CaCO ₃)		Hardness		Chlorine (mg/L)
	0	24	0	24	0	24	0	24					
0	7.8	7.1	7.91	7.90	304	324		24.4	60		80		-
10	7.9	7.3	7.92	8.12	300	292		24.4					
100	8.1	7.4	7.97	8.07	340	365		24.5					
500	8.1	7.4	7.98	8.08	494	530		24.5					
1000	7.9	7.1	7.98	8.09	696	744		24.7					
5000	8.1	7.4	7.96	8.07	2090	2220		25.1					
10,000	8.1	7.0	7.95	8.03	3940	4170		24.5					
									60		80		-

Conc. or mg/L	Rep #	Cont. #	rotifer #		% Survival	Conc. or %	Rep #	Cont. #	rotifer #		% Survival
			0	24					0	24	
0	1	1	5	5	100	1000	1	25	5	5	100
	2	2	5	5			2	26	5	5	
	3	3	5	5			3	27	5	5	
	4	4	5				4	28	5		
	5	5	5				5	29	5		
	6	6	5				6	30	5		
10	1	7	5	5	100	5000	1	31	5	4	93
	2	8	5	5			2	32	5	5	
	3	9	5	5			3	33	5	5	
	4	10	5				4	34	5		
	5	11	5				5	35	5		
	6	12	5				6	36	5		
100	1	13	5	5	100	10,000	2	37	5	4	53
	2	14	5	5			3	38	5	3	
	3	15	5	5			4	39	5	1	
	4	16	5				5	40	5		
	5	17	5				6	41	5		
	6	18	5				1	42	5		
500	1	19	5	5	100		1	43	5		
	2	20	5	5			2	44	5		
	3	21	5	5			3	45	5		
	4	22	5				4	46	5		
	5	23	5				5	47	5		
	6	24	5				6	48	5		
Analyst			m			Analyst			m		

Comments: Highest concentration, rotifers alive but not moving around. Analysts: LB m

Rotifer Test-24 Hr Survival

Start Date: 4/8/03 Test ID: 0304-15NW Sample ID: BEAZER
 End Date: 4/9/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: BMSA-benzene monosulfonic acid
 Sample Date: 4/8/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus
 Comments: range finding test

Conc-mg/L	1	2	3
D-Control	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000
5000	0.8000	1.0000	1.0000
10000	0.8000	0.6000	0.2000

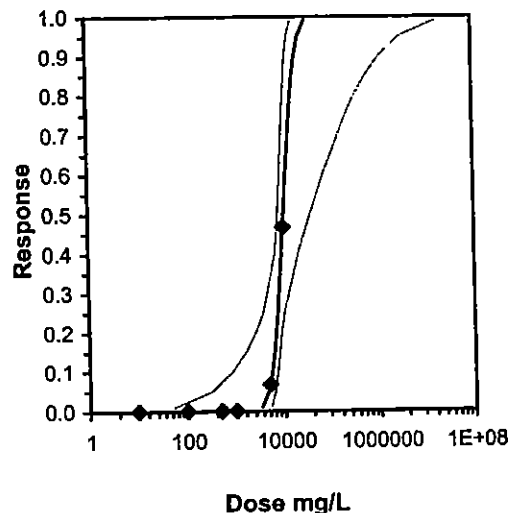
Conc-mg/L	Transform: Arcsin Square Root							1-Tailed		Number		Total
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Resp	Number
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3				0	15
10	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3	0.000	2.530	0.2769	0	15
100	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3	0.000	2.530	0.2769	0	15
500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3	0.000	2.530	0.2769	0	15
1000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3	0.000	2.530	0.2769	0	15
5000	0.9333	0.9333	1.2659	1.1071	1.3453	10.861	3	0.725	2.530	0.2769	1	15
*10000	0.5333	0.5333	0.8190	0.4636	1.1071	39.924	3	4.808	2.530	0.2769	7	15

Auxiliary Tests					Statistic	Critical	Skew	Kurt			
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)					0.66585	0.873	-0.925	6.55047			
Equality of variance cannot be confirmed											
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		5000	10000	7071.07		0.18191	0.19148	0.11545	0.01797	0.00202	6, 14

Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chl-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	4.70883	1.97297	0.84182	8.57585	0	1.2E-05	9.48773	1	4.01776	0.21237	3
Intercept	-13.919	7.72001	-29.05	1.21225							

Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	3339.82	53.36	5224.36
EC05	3.355	4660.68	335.223	6440.65
EC10	3.718	5566.76	877.934	7323.73
EC15	3.964	6275.63	1649.08	8141.6
EC20	4.158	6902.86	2649.87	9096.24
EC25	4.326	7490.7	3820.88	10421.9
EC40	4.747	9203.63	6839.93	20627.3
EC50	5.000	10417.5	8027.99	37616.8
EC60	5.253	11791.4	8978.29	71992.7
EC75	5.674	14487.7	10416	219870
EC80	5.842	15721.5	10985.3	344414
EC85	6.036	17292.8	11662.8	582401
EC90	6.282	19494.9	12546.7	1130459
EC95	6.645	23284.9	13940.1	3030036
EC99	7.326	32493.8	16895.3	1.9E+07

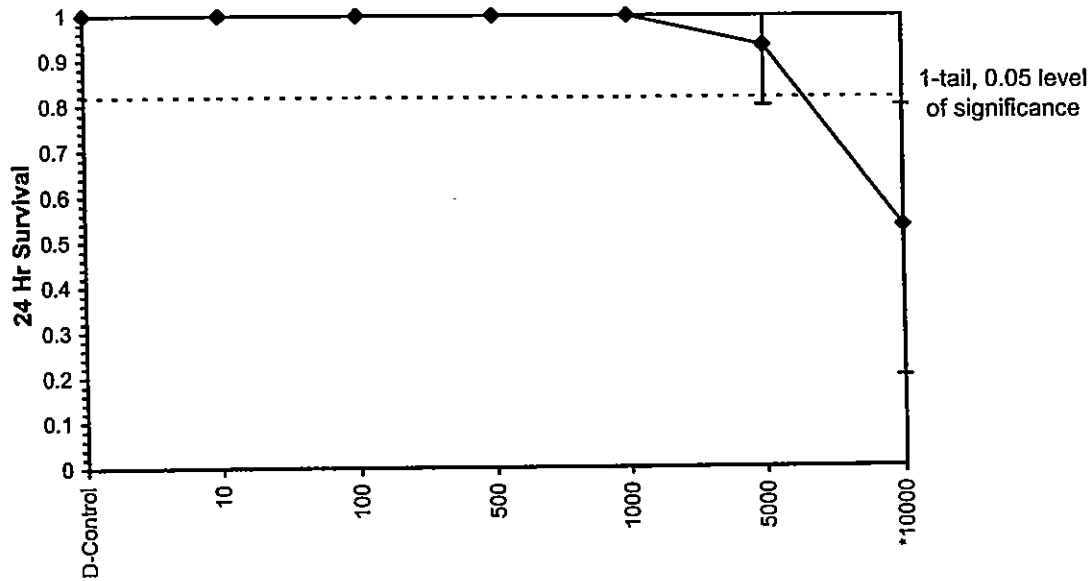
Significant heterogeneity detected (p < 0.01)



Rotifer Test-24 Hr Survival

Start Date: 4/8/03	Test ID: 0304-15NW	Sample ID: BEAZER
End Date: 4/9/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BMSA-benzene monosulfonic acid
Sample Date: 4/8/03	Protocol: ASTM E1440	Test Species: BC-Brachionus calyciflorus
Comments: range finding test		

Dose-Response Plot



AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Rotifer Rapid Screen Test 24 Hour Acute Test Data Sheet

Beazer - Range finder - 3 reps

Client: Beazer
Sample ID: PSA
Test #: 0304-16NW

Start Date & Time: 4/8/03 1230
End Date & Time: 4/9/03 1155
Test Organism: Brachionus calyciflorus

Conc. or mg/L	DO (mg/L)		pH (units)		Conductivity (µS/cm)		Temperature (°C)		Alkalinity (mg/L as CaCO ₃)	Hardness	Chlorine (mg/L)
	0	24	0	24	0	24	0	24			
0	7.8	7.1	7.91	7.90	304	324		24.4	60	80	—
10	8.0	7.3	7.90	8.04	303	328		24.7			
100	7.7	7.2	7.75	8.03	334	361		24.9			
500	7.8	7.4	7.48	7.88	452	490		24.9			
1000	7.9	7.0	7.35	7.71	601	650		24.9			
5000	8.0	7.0	6.95	7.45	1725	1840		24.5			
10,000	8.1	7.1	6.74	7.12	3080	3280		24.6			

Conc. or mg/L	Rep #	Cont. #	rotifer #		% Survival	Conc. or %	Rep #	Cont. #	rotifer #		% Survival
			0	24					0	24	
0	1	1	5	5	100	1000	1	25	5	5	100
	2	2	5	5			2	26	5	5	
	3	3	5	5			3	27	5	5	
	4	4	5				4	28	5		
	5	5	5				5	29	5		
	6	6	5				6	30	5		
10	1	7	5	5	100	5000	1	31	5	5	100
	2	8	5	5			2	32	5	5	
	3	9	5	5			3	33	5	5	
	4	10	5				4	34	5		
	5	11	5				5	35	5		
	6	12	5				6	36	5		
100	1	13	5	5	100	10,000	2	37	5	4	87
	2	14	5	5			3	38	5	4	
	3	15	5	5			4	39	5	5	
	4	16	5				5	40	5		
	5	17	5				6	41	5		
	6	18	5				1	42	5		
500	1	19	5	5	100		1	43	5		
	2	20	5	5			2	44	5		
	3	21	5	5			3	45	5		
	4	22	5				4	46	5		
	5	23	5				5	47	5		
	6	24	5				6	48	5		
Analyst			mw			Analyst			mw		

Comments:

Analysts:

Rotifer Test-24 Hr Survival

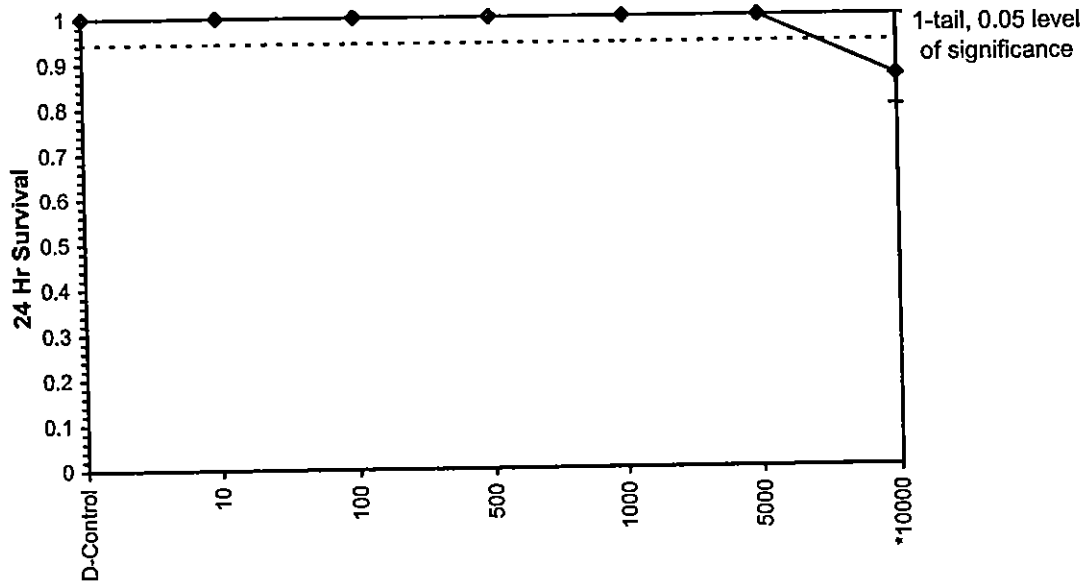
Start Date: 4/8/03 Test ID: 0304-16NW Sample ID: BEAZER
End Date: 4/9/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: PSA-p-phenol sulfonic acid
Sample Date: 4/8/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus
Comments: range finding test

Conc-mg/L	1	2	3
D-Control	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000
5000	1.0000	1.0000	1.0000
10000	0.8000	0.8000	1.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed	
			Mean	Min	Max	CV%	N		Critical	MSD
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3			
10	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3	0.000	2.530	0.1073
100	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3	0.000	2.530	0.1073
500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3	0.000	2.530	0.1073
1000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3	0.000	2.530	0.1073
5000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	3	0.000	2.530	0.1073
*10000	0.8667	0.8667	1.1865	1.1071	1.3453	11.587	3	3.742	2.530	0.1073

Auxiliary Tests					Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)					0.48815	0.873	2.01793	10		
Equality of variance cannot be confirmed										
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	5000	10000	7071.07		0.05676	0.05975	0.0108	0.0027	0.01528	6, 14

Dose-Response Plot



Acute Exposure Appendix C
Bioassay Water Quality, Survival, and Statistical Summaries
Definitive Study

Ceriodaphnia dubia

Acute Exposure

Appendix Table C-1a.
Water Quality Summary for 48-hour *Ceriodaphnia dubia*
Exposure to Benzene Metadisulfonic Acid (BMDSA)

Initiated: 10 December 2002

Concentration (mg/L)	Rep	Number of Live Organisms			DO (mg/L)		pH (pH units)		Cond. (mmhos/cm)		Temperature (°C)			Percent Survival
		0	24	48	0	48	0	48	0	48	0	24	48	
Control	A	5	5	5	7.9	8.5	8.09	8.05	192	203	24.0	24.2	24.1	100
	B	5	5	5										100
	C	5	5	5										100
	D	5	5	5										100
500	A	5	5	5	7.9	8.5	8.21	8.17	494	477	24.0	24.2	24.1	100
	B	5	5	5										100
	C	5	5	5										100
	D	5	5	5										100
1,000	A	5	5	5	7.9	8.5	8.25	8.17	731	769	24.0	24.2	24.1	100
	B	5	5	5										100
	C	5	5	5										100
	D	5	5	5										100
2,000	A	5	5	5	7.9	8.2	8.26	8.16	1375	1333	24.0	24.2	24.1	100
	B	5	5	5										100
	C	5	5	5										100
	D	5	5	5										100
4,000	A	5	5	4	7.9	8.2	8.26	8.18	2490	2380	24.0	24.2	24.1	80
	B	5	5	5										100
	C	5	5	5										100
	D	5	5	5										100
8,000	A	5	5	1	7.9	8.2	8.25	8.17	4720	4460	24.0	24.2	24.1	20
	B	5	5	1										20
	C	5	5	2										40
	D	5	5	3										60
10,000	A	5	5	2	7.9	8.3	8.24	8.13	5700	5670	24.0	24.2	24.1	40
	B	5	4	0										0
	C	5	5	0										0
	D	5	5	0										0

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Daphnia Acute Survival Bioassay-48 Hr Survival

Start Date: 12/10/2002 Test ID: 0212-129 Sample ID: BEAZER
 End Date: 12/12/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: EPAA 93-EPA Acute Test Species: CD-Ceriodaphnia dubia
 Comments: BMDSA

Conc-mg/L	1	2	3	4
L-Lab Control	1.0000	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000
2000	1.0000	1.0000	1.0000	1.0000
4000	0.8000	1.0000	1.0000	1.0000
8000	0.2000	0.2000	0.4000	0.6000
10000	0.4000	0.0000	0.0000	0.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Number Resp	Total Number
			Mean	Min	Max	CV%	N				
L-Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			0	20
500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
1000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
2000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
4000	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	1	20
*8000	0.3500	0.3500	0.6245	0.4636	0.8861	32.527	4	10.00	10.00	13	20
*10000	0.1000	0.1000	0.3403	0.2255	0.6847	67.468	4	10.00	10.00	18	20

Auxiliary Tests

Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01) Statistic 0.78913 Critical 0.896 Skew 1.24226 Kurt 3.58019
 Equality of variance cannot be confirmed

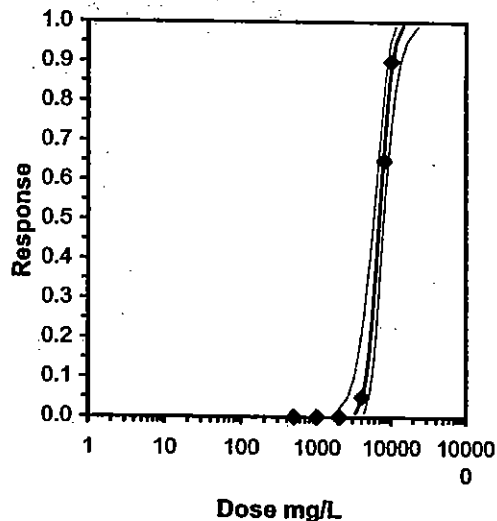
Hypothesis Test (1-tail, 0.05) NOEC LOEC ChV TU

Steel's Many-One Rank Test 4000 8000 5656.85

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	7.22904	1.50671	4.27588	10.1822	0	0.18791	9.48773	1	3.83785	0.13833	3
Intercept	-22.744	5.85128	-34.212	-11.275							
TSCR											

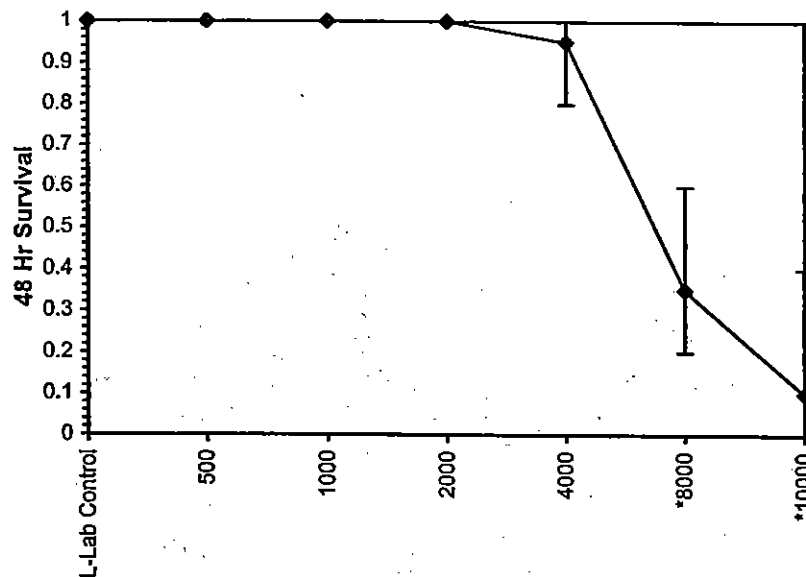
Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	3281.25	1793.61	4286.62
EC05	3.355	4076.73	2569.48	5038.57
EC10	3.718	4576.86	3105.36	5504.11
EC15	3.964	4948.52	3523.46	5850.98
EC20	4.158	5265.31	3890.64	6149.93
EC25	4.326	5553.2	4230.85	6426.35
EC40	4.747	6350.39	5185.63	7235.08
EC50	5.000	6884.08	5812.05	7835.15
EC60	5.253	7462.63	6453.94	8564.14
EC75	5.674	8533.92	7501.46	10167.5
EC80	5.842	9000.53	7904.91	10963.9
EC85	6.036	9576.72	8370.17	12017.7
EC90	6.282	10354.4	8955.65	13547.5
EC95	6.645	11624.7	9842.3	16274.4
EC99	7.326	14442.8	11634	23183.6



Daphnia Acute Survival Bioassay-48 Hr Survival

Start Date: 12/10/2002	Test ID: 0212-129	Sample ID: BEAZER
End Date: 12/12/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: EPAA 93-EPA Acute	Test Species: CD-Ceriodaphnia dubia
Comments: BMDSA		

Dose-Response Plot



Appendix Table C-1b.
Water Quality Summary for 48-hour *Ceriodaphnia dubia*
Exposure to Benzene Monosulfonic Acid (BMSA)

Initiated: 10 December 2002

Concentration (mg/L)	Rep	Number of Live Organisms			DO (mg/L)		pH (pH units)		Cond. (mmhos/cm)		Temperature (°C)			Percent Survival
		0	24	48	0	48	0	48	0	48	0	24	48	
Control	A	5	5	5	7.9	8.5	8.09	8.01	192	208	24.2	24.2	24.1	100
	B	5	5	5										100
	C	5	5	5										100
	D	5	5	5										100
500	A	5	5	5	7.9	8.5	8.12	8.12	395	405	24.2	24.2	24.1	100
	B	5	5	5										100
	C	5	5	5										100
	D	5	4	4										80
1,000	A	5	5	5	7.9	8.6	8.18	8.16	601	615	24.2	24.2	24.1	100
	B	5	5	5										100
	C	5	5	5										100
	D	5	5	5										100
2,000	A	5	5	5	7.9	8.4	8.23	8.17	971	982	24.0	24.2	24.1	100
	B	5	5	5										100
	C	5	4	4										80
	D	5	5	5										100
4,000	A	5	5	5	7.9	8.5	8.25	8.19	1790	1803	24.0	24.2	24.1	100
	B	5	5	5										100
	C	5	4	4										80
	D	5	5	5										100
8,000	A	5	5	4	7.9	8.7	8.23	8.18	3280	3290	24.0	24.2	24.1	80
	B	5	5	3										60
	C	5	5	2										40
	D	5	5	3										60
10,000	A	5	4	0	7.9	8.5	8.22	8.16	4020	4140	24.0	24.2	24.1	0
	B	5	4	0										0
	C	5	5	2										40
	D	5	5	0										0

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Daphnia Acute Survival Bioassay-48 Hr Survival

Start Date: 12/10/2002 Test ID: 0212-130 Sample ID: BEAZER
 End Date: 12/12/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: EPAA 93-EPA Acute Test Species: CD-Ceriodaphnia dubia
 Comments: BMSA

Conc-mg/L	1	2	3	4
L-Lab Control	1.0000	1.0000	1.0000	1.0000
500	1.0000	1.0000	0.8000	1.0000
1000	1.0000	1.0000	1.0000	1.0000
2000	1.0000	1.0000	1.0000	1.0000
4000	1.0000	1.0000	1.0000	1.0000
8000	0.2000	0.0000	0.0000	0.0000
10000	0.0000	0.0000	0.0000	0.0000

Conc-mg/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N				
L-Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			0	20
500	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	1	20
1000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
2000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
4000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
*8000	0.0500	0.0500	0.2850	0.2255	0.4636	41.771	4	10.00	10.00	19	20
*10000	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	4	10.00	10.00	20	20

Auxiliary Tests

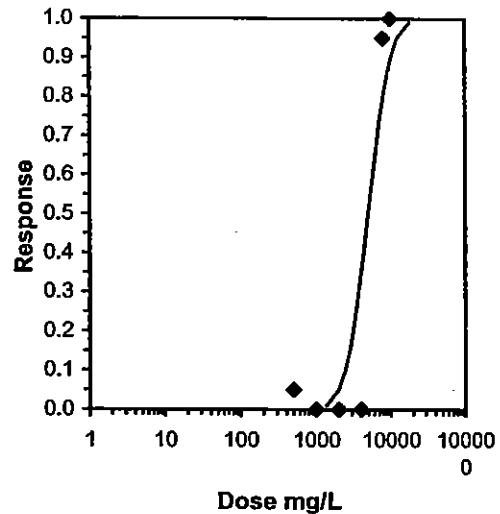
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$) Statistic 0.70981 Critical 0.896 Skew ##### Kurt 6.47308
 Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)

Steel's Many-One Rank Test NOEC LOEC ChV TU

Maximum Likelihood-Probit										
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma
Slope	4.133	18.2286	-46.478	54.7438	0	2729.36	9.48773	0.0E+00	3.69761	0.24195
Intercept	-10.282	68.0448	-199.21	178.641						

Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	1363.76		
EC05	3.355	1993.56		
EC10	3.718	2440.8		
EC15	3.964	2797.94		
EC20	4.158	3118.71		
EC25	4.326	3423.05		
EC40	4.747	4328.23		
EC50	5.000	4984.36		
EC60	5.253	5739.94		
EC75	5.674	7257.8		
EC80	5.842	7966.06		
EC85	6.036	8879.31		
EC90	6.282	10178.6		
EC95	6.645	12462		
EC99	7.326	18217.1		

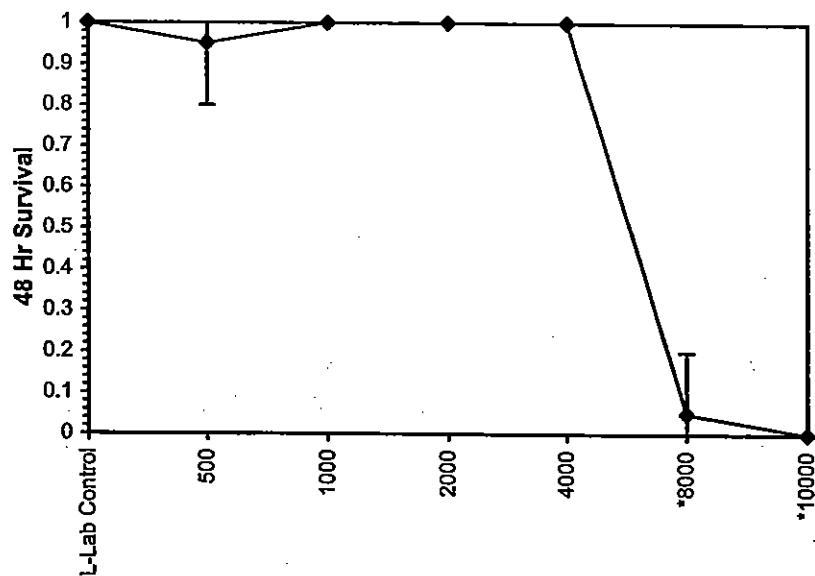


Significant heterogeneity detected ($p = 0.00E+00$)

Daphnia Acute Survival Bioassay-48 Hr Survival

Start Date: 12/10/2002	Test ID: 0212-130	Sample ID: BEAZER
End Date: 12/12/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: EPAA 93-EPA Acute	Test Species: CD-Ceriodaphnia dubia
Comments: BMSA		

Dose-Response Plot



Appendix Table C-1c.
Water Quality Summary for 48-hour *Ceriodaphnia dubia*
Exposure to P-Phenol Sulfonic Acid (PSA)

Initiated: 10 December 2002

Concentration (mg/L)	Rep	Number of Live Organisms			DO (mg/L)		pH (pH units)		Cond. (mmhos/cm)		Temperature (°C)			Percent Survival
		0	24	48	0	48	0	48	0	48	0	24	48	
Control	A	5	5	5	7.9	8.5	8.09	8.15	192	212	24.0	24.2	24.1	100
	B	5	5	5										100
	C	5	5	5										100
	D	5	5	5										100
500	A	5	5	5	7.9	8.4	7.57	8.14	346	365	24.0	24.2	24.1	100
	B	5	5	5										100
	C	5	5	4										80
	D	5	5	5										100
1,000	A	5	5	5	7.9	8.3	7.44	8.07	504	522	24.0	24.2	24.1	100
	B	5	5	5										100
	C	5	5	5										100
	D	5	5	5										100
2,000	A	5	5	5	7.9	8.2	7.30	7.95	793	813	24.0	24.2	24.1	100
	B	5	5	5										100
	C	5	5	5										100
	D	5	5	5										100
4,000	A	5	5	5	7.8	8.4	7.12	7.76	1387	1428	24.0	24.2	24.1	100
	B	5	5	5										100
	C	5	5	5										100
	D	5	5	5										100
8,000	A	5	5	1	7.9	8.4	6.94	7.49	2500	2560	24.0	24.2	24.1	20
	B	5	5	0										0
	C	5	5	0										0
	D	5	5	0										0
10,000	A	5	3	0	7.8	8.1	6.85	7.36	3060	3280	24.0	24.2	24.1	0
	B	5	2	0										0
	C	5	4	0										0
	D	5	3	0										0

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Daphnia Acute Survival Bioassay-48 Hr Survival

Start Date: 12/10/2002 Test ID: 0212-128 Sample ID: BEAZER
 End Date: 12/12/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: EPAA 93-EPA Acute Test Species: CD-Ceriodaphnia dubia
 Comments: PSA

Conc-mg/L	1	2	3	4
L-Lab Control	1.0000	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000	0.8000
1000	1.0000	1.0000	1.0000	1.0000
2000	1.0000	1.0000	0.8000	1.0000
4000	1.0000	1.0000	0.8000	1.0000
8000	0.8000	0.6000	0.4000	0.6000
10000	0.0000	0.0000	0.4000	0.0000

Conc-mg/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N				
L-Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			0	20
500	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	1	20
1000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
2000	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	1	20
4000	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	1	20
*8000	0.6000	0.6000	0.8910	0.6847	1.1071	19.366	4	10.00	10.00	8	20
*10000	0.1000	0.1000	0.3403	0.2255	0.6847	67.468	4	10.00	10.00	18	20

Auxiliary Tests

Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$) Statistic: 0.87706 Critical: 0.896 Skew: 0.54666 Kurt: 1.8502

Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05) NOEC LOEC ChV TU

Steel's Many-One Rank Test 4000 8000 5656.85

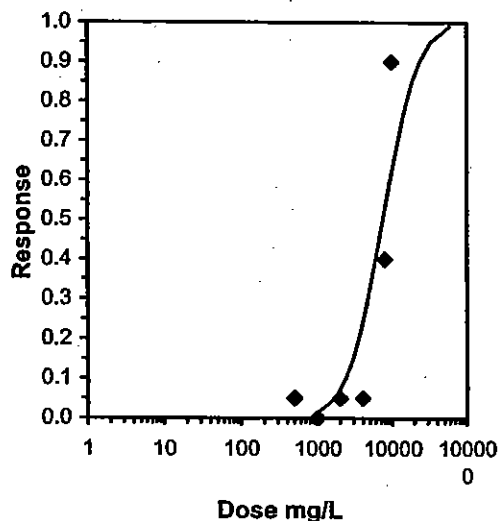
Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits	Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	2.57412	1.86521	-2.6046 7.75279	0	50.624	9.48773	2.7E-10	3.87489	0.38848	6
Intercept	-4.9744	6.9907	-24.384 14.4349							

TSCR

Point	Probits	mg/L	95% Fiducial Limits
EC01	2.674	935.719	
EC05	3.355	1721.45	
EC10	3.718	2382.49	
EC15	3.964	2966.57	
EC20	4.158	3531.31	
EC25	4.326	4100.75	
EC40	4.747	5976.82	
EC50	5.000	7497.07	
EC60	5.253	9404	
EC75	5.674	13706.3	
EC80	5.842	15916.5	
EC85	6.036	18946.5	
EC90	6.282	23591.3	
EC95	6.645	32650.4	
EC99	7.326	60067.2	

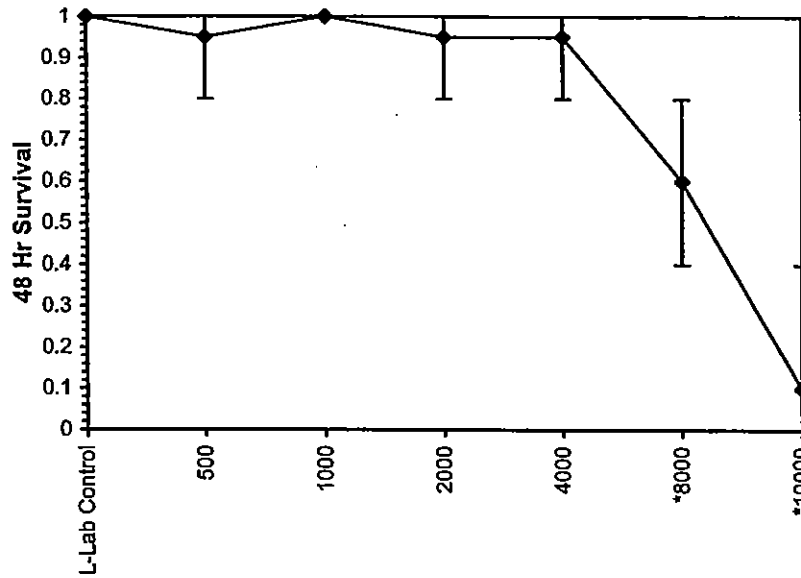
Significant heterogeneity detected ($p = 2.67E-10$)



Daphnia Acute Survival Bioassay-48 Hr Survival

Start Date: 12/10/2002	Test ID: 0212-128	Sample ID: BEAZER
End Date: 12/12/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: EPAA 93-EPA Acute	Test Species: CD-Ceriodaphnia dubia
Comments: PSA		

Dose-Response Plot



Ceriodaphnia dubia

Chronic Exposure

**Water Quality Summary for 7-day *Ceriodaphnia dubia*
Exposure to Benzene Metadisulfonic Acid (BMDSA)**

Initiated: 10 December 2002

Concentration	Lab Control							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.09	8.19	7.91	8.47	8.26	8.14	8.16	
DO (mg/L)	7.9	7.7	8.2	8.0	8.4	7.9	8.0	
Cond. (µmhos-cm)	192	195	200	196	195	194	195	
Temp (°C)	24.0	24.5	25.0	24.0	24.2	24.3	24.4	
Final								
pH		7.89	7.97	7.85	7.98	7.96	8.62	7.79
DO (mg/L)		7.3	8.3	8.0	8.4	8.0	8.1	7.8
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

Concentration	4,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.26	8.34	8.29	8.39	8.35	8.38	8.37	
DO (mg/L)	7.9	7.9	8.2	7.9	8.3	7.9	7.8	
Cond. (µmhos-cm)	2490	2500	2600	2530	2490	2460	2470	
Temp (°C)	24.0	24.0	25.0	24.5	24.2	24.0	25.5	
Final								
pH		8.03	8.11	8.01	8.14	8.16	7.88	8.00
DO (mg/L)		7.5	8.4	7.8	8.1	8.1	7.8	7.5
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

Concentration	500 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.21	8.26	8.14	8.47	8.34	8.28	8.30	
DO (mg/L)	7.9	7.9	8.1	7.8	8.3	7.8	8.0	
Cond. (µmhos-cm)	494	473	498	498	484	466	454	
Temp (°C)	24.0	24.0	25.0	24.2	24.3	24.3	24.4	
Final								
pH		7.94	8.04	7.89	8.10	8.07	8.30	7.90
DO (mg/L)		7.3	8.4	8.0	8.2	8.1	8.0	7.7
Temp (°C)		24.2	24.4	24.6	24.2	24.3	24.5	24.8

Concentration	8,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.25	8.33	8.27	8.36	8.35	8.42	NR	
DO (mg/L)	7.9	7.9	8.3	8.0	8.4	8.0	NR	
Cond. (µmhos-cm)	4720	4590	4750	4680	4500	4430	NR	
Temp (°C)	24.0	24.0	25.1	24.7	24.1	24.0	NR	
Final								
pH		8.10	8.09	8.06	8.18	NR	NR	NR
DO (mg/L)		8.0	8.2	8.1	8.5	NR	NR	NR
Temp (°C)		24.2	24.1	24.6	24.2	NR	NR	NR

Concentration	1,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.25	8.31	8.23	8.44	8.34	8.34	8.34	
DO (mg/L)	7.9	7.9	8.2	7.8	8.3	7.9	8.0	
Cond. (µmhos-cm)	731	789	823	806	783	767	782	
Temp (°C)	24.0	24.0	25.1	24.2	24.3	24.3	24.8	
Final								
pH		7.97	8.06	7.97	8.12	8.13	8.15	7.95
DO (mg/L)		7.3	8.3	7.9	8.2	8.1	7.7	7.6
Temp (°C)		24.2	24.1	24.6	24.2	24.0	24.5	24.8

Concentration	10,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.24	8.31	8.26	8.32	8.33	NR	NR	
DO (mg/L)	7.9	8.0	8.3	8.1	8.2	NR	NR	
Cond. (µmhos-cm)	5700	5580	5810	5800	5580	NR	NR	
Temp (°C)	24.0	24.0	25.0	25.2	24.1	NR	NR	
Final								
pH		8.09	8.09	8.07	NR	NR	NR	NR
DO (mg/L)		7.9	8.3	8.1	NR	NR	NR	NR
Temp (°C)		24.2	24.1	24.6	NR	NR	NR	NR

Concentration	2,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.26	8.34	8.27	8.40	8.35	8.32	8.36	
DO (mg/L)	7.9	7.9	8.2	8.0	8.3	7.9	7.7	
Cond. (µmhos-cm)	1375	1381	1430	1405	1371	1350	1378	
Temp (°C)	24.0	24.0	25.1	24.4	24.3	24.2	24.9	
Final								
pH		8.01	8.08	8.00	8.14	8.14	8.10	7.99
DO (mg/L)		7.5	8.3	8.0	8.3	8.1	7.7	7.6
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Notes: NR = not recorded because all organisms in that concentration were dead

Appendix Table C-3a.
Water Quality Summary for 7-day *Ceriodaphnia dubia*
Exposure to Benzene Metadisulfonic Acid (BMDSA)

Initiated: 10 December 2002

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
Lab Control	1	0	0	0	5	15	19	a	39
	2	0	0	0	8	14	0	a	22
	3	0	0	0	6	13	24	a	43
	4	0	0	0	7	12	22	a	41
	5	0	0	0	4	9	12	a	25
	6	0	0	7	14	0	23	a	44
	7	0	0	6	12	0/d	--	--	18/d
	8	0	0	7	13	0	19	a	39
	9	0	0	0	7	12	22	a	41
	10	0	0	5	0	15	21	a	41

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
2,000	1	0	0	6	0	9	15	a	30
	2	0	0	7	0	13	24	d	44/d
	3	0	0	0	7	5	2	a	14
	4	0	0	5	0	9	15	a	29
	5	0	LIP	--	--	--	--	--	LIP
	6	0	0	6	0	9	17	a	32
	7	0	0	5	13	0	18	a	36
	8	0	0	8	0	11	19	d	38/d
	9	0	0	5	10	3	17	d	35/d
	10	0	0	6	0	13	15	d	34/d

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
8,000	1	0	0/d	--	--	--	--	--	0/d
	2	0	0	0	0	0/d	--	--	0/d
	3	0	0	0/d	--	--	--	--	0/d
	4	0	0	0/d	--	--	--	--	0/d
	5	0	0	0/d	--	--	--	--	0/d
	6	0	0	0	0/d	--	--	--	0/d
	7	0	0	0/d	--	--	--	--	0/d
	8	0	0/d	--	--	--	--	--	0/d
	9	0	0	0/d	--	--	--	--	0/d
	10	0	0	0/d	--	--	--	--	0/d

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
500	1	0	0	5	0	13	20	a	38
	2	0	0	0	6	13	18	a	37
	3	0	0	6	12	0	19	a	37
	4	0	0	LIP	--	--	--	--	LIP
	5	0	0	5	13	0	20	a	38
	6	0	0	1	2	13	18	a	34
	7	0	0	0	9	13	21	a	43
	8	0	0	6	12	17	24	a	59
	9	0	0	0	6	10	14	a	30
	10	0	0	0	6	15	16	a	37

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
4,000	1	0	0	0	4	4	0	a	8
	2	0	0	0	3	3	5	a	11
	3	0	0	0	3	5	5	a	13
	4	0	0	3	0	7	4	a	14
	5	0	0	0	3	5	0	a	8
	6	0	0	3	0	7	4	a	14
	7	0	0	5	0	7	4	d	16/d
	8	0	0	0	3	3	5	a	11
	9	0	0	3	0	10	9	d	22/d
	10	0	0	0	2	3	0	d	5/d

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
10,000	1	0	0	0/d	--	--	--	--	0/d
	2	0	0	0/d	--	--	--	--	0/d
	3	0	0	0/d	--	--	--	--	0/d
	4	0	0	0/d	--	--	--	--	0/d
	5	0	0/d	--	--	--	--	--	0/d
	6	0	0	0/d	--	--	--	--	0/d
	7	0	0/d	--	--	--	--	--	0/d
	8	0	0	0/d	--	--	--	--	0/d
	9	0	0/d	--	--	--	--	--	0/d
	10	0	0	0/d	--	--	--	--	0/d

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
1,000	1	0	0	6	0	13	19	a	38
	2	0	0	8	0	14	20	a	42
	3	0	0	0	11	17	16	a	44
	4	0	0	7	2	12	18	a	39
	5	0	0	6	14	0	16	a	36
	6	0	0	7	14	0	18	a	39
	7	0	0	6	15	0	17	a	38
	8	0	0	4	15	0	19	a	38
	9	0	0	5	12	0	21	a	38
	10	0	0	6	0	11	16	a	33

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Notes: d = organism dead

a = organism alive, reproductive counts not taken because test acceptability criteria were met on day 6.

LIP = organism lost in process, excluded from statistical analysis

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

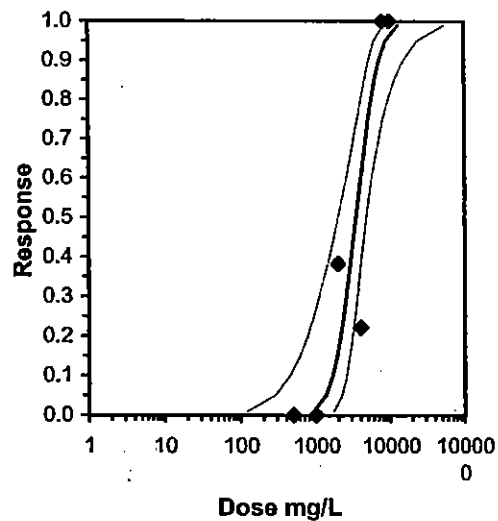
Start Date: 12/10/2002 Test ID: 0212-209 Sample ID: BEAZER
 End Date: 12/17/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: EPAF 94-EPA Freshwater Cf Test Species: CD-Ceriodaphnia dubia
 Comments: BMDSA

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
L-Lab Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	
4000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	0.0000	0.0000
8000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-mg/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
L-Lab Control	0.9000	1.0000	1	9	10	10			1	10
500	1.0000	1.1111	0	9	9	9	0.5263	0.0500	0	9
1000	1.0000	1.1111	0	10	10	10	0.5000	0.0500	0	10
2000	0.5556	0.6173	4	5	9	9	0.1192	0.0500	4	9
4000	0.7000	0.7778	3	7	10	10	0.2910	0.0500	3	10
*8000	0.0000	0.0000	10	0	10	10	0.0001	0.0500	10	10
*10000	0.0000	0.0000	10	0	10	10	0.0001	0.0500	10	10

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	4000	8000	5656.85	

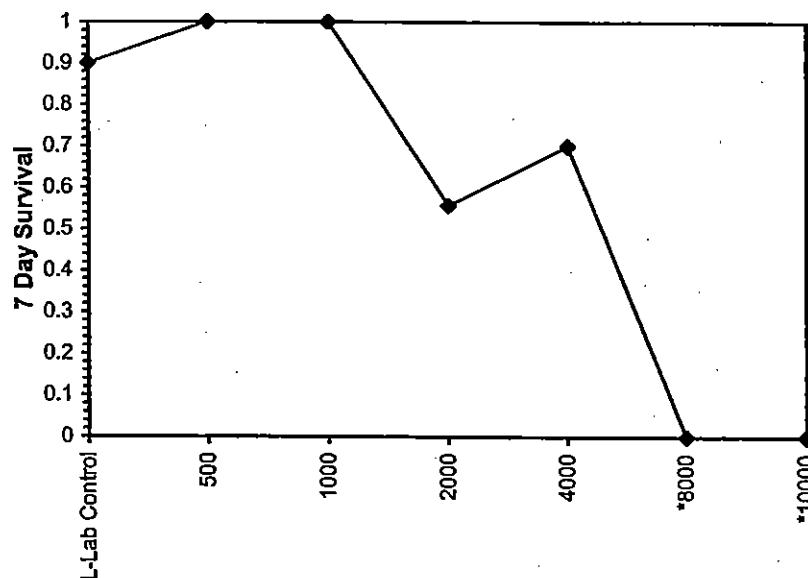
Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	4.015	1.13494	1.79052	6.23949	0.1	9.47961	9.48773	0.05	3.54078	0.24907	8
Intercept	-9.2162	4.12763	-17.306	-1.1261							
TSCR	0.0444	0.04249	-0.0389	0.12767							
Point	Probits	mg/L	95% Fiducial Limits								
EC01	2.674	914.879	120.096	1705.48							
EC05	3.355	1352.39	283.58	2231.19							
EC10	3.718	1665.66	446.152	2587.37							
EC15	3.964	1917.07	603.747	2868.6							
EC20	4.158	2143.67	765.727	3122.31							
EC25	4.326	2359.31	936.421	3366.72							
EC40	4.747	3003.84	1528.22	4141.88							
EC50	5.000	3473.58	2011.82	4785.09							
EC60	5.253	4016.78	2584.93	5664.07							
EC75	5.674	5114.11	3646.78	8060.7							
EC80	5.842	5628.55	4076.67	9508.34							
EC85	6.036	6293.87	4577.26	11690.4							
EC90	6.282	7243.83	5212.6	15401.5							
EC95	6.645	8921.84	6192.38	23653.2							
EC99	7.326	13188.4	8278.54	54655.2							



Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date: 12/10/2002	Test ID: 0212-209	Sample ID: BEAZER
End Date: 12/17/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: EPAF 94-EPA Freshwater Cf Test Species:	CD-Ceriodaphnia dubia
Comments: BMDSA		

Dose-Response Plot



Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 12/10/2002 Test ID: 0212-209 Sample ID: BEAZER
 End Date: 12/17/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: EPAF 94-EPA Freshwater Cf Test Species: CD-Ceriodaphnia dubia
 Comments: BMDSA

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
L-Lab Control	39.000	22.000	43.000	41.000	25.000	44.000	18.000	39.000	41.000	41.000
500	38.000	37.000	37.000	38.000	34.000	43.000	59.000	30.000	37.000	
1000	38.000	42.000	44.000	39.000	36.000	39.000	38.000	38.000	38.000	33.000
2000	30.000	44.000	14.000	29.000	32.000	36.000	38.000	35.000	34.000	
4000	8.000	11.000	13.000	14.000	8.000	14.000	16.000	11.000	22.000	5.000
8000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Conc-mg/L	Transform: Untransformed							Rank Sum	1-Tailed Critical		
	Mean	N-Mean	Mean	Min	Max	CV%	N			Mean	N-Mean
L-Lab Control	35.300	1.0000	35.300	18.000	44.000	27.402	10			35.300	0.0000
500	39.222	1.1111	39.222	30.000	59.000	20.861	9	84.50	60.00	39.222	-0.1111
1000	38.500	1.0907	38.500	33.000	44.000	7.768	10	98.50	73.00	38.500	-0.0907
2000	32.444	0.9191	32.444	14.000	44.000	25.422	9	75.50	60.00	32.444	0.0809
*4000	12.200	0.3456	12.200	5.000	22.000	39.367	10	56.50	73.00	12.200	0.6544
*8000	0.000	0.0000	0.000	0.000	0.000	0.000	10	55.00	73.00	0.000	1.0000
*10000	0.000	0.0000	0.000	0.000	0.000	0.000	10	55.00	73.00	0.000	1.0000

Auxiliary Tests

Kolmogorov D Test indicates non-normal distribution (p <= 0.01) Statistic: 1.50477 Critical: 1.035 Skew: -0.3299 Kurt: 3.70045

Equality of variance cannot be confirmed

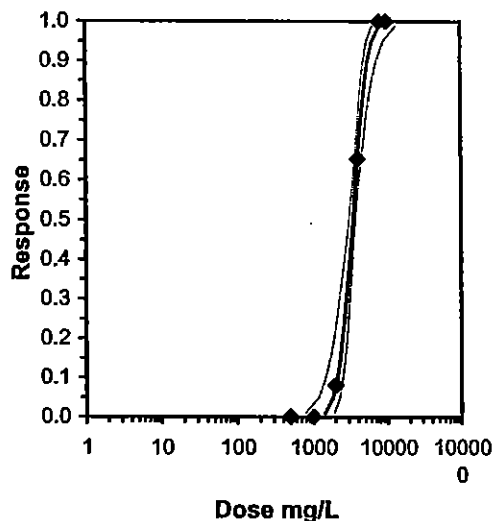
Hypothesis Test (1-tail, 0.05) NOEC LOEC ChV TU

Wilcoxon Rank Sum Test 2000 4000 2828.43

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	6.12449	1.19342	3.78539	8.46358	0	8.78778	9.48773	0.07	3.53602	0.16328	4
Intercept	-16.656	4.26092	-25.008	-8.3049							

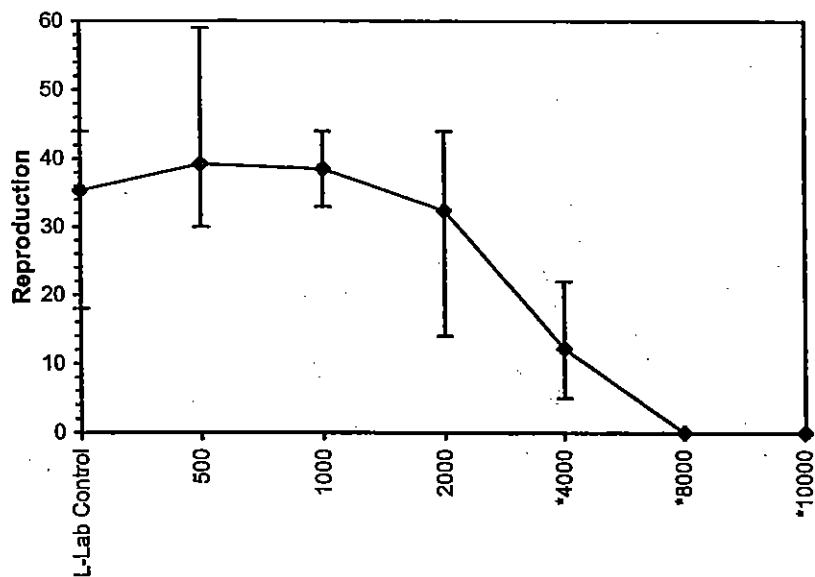
Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	1432.76	787.905	1883.17
EC05	3.355	1851.17	1188.12	2275.4
EC10	3.718	2122.1	1477.02	2520.17
EC15	3.964	2326.96	1708.99	2702.67
EC20	4.158	2503.78	1917.32	2859.7
EC25	4.326	2666.16	2114.1	3004.61
EC40	4.747	3123.56	2683.4	3429.59
EC50	5.000	3435.71	3063.47	3754.69
EC60	5.253	3779.05	3443.48	4174.96
EC75	5.674	4427.37	4029.29	5169.35
EC80	5.842	4714.49	4252.87	5673.89
EC85	6.036	5072.75	4515.4	6343.78
EC90	6.282	5562.45	4855.18	7320.73
EC95	6.645	6376.55	5389.18	9081.07
EC99	7.326	8238.72	6523.54	13668.8



Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 12/10/2002	Test ID: 0212-209	Sample ID: BEAZER
End Date: 12/17/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: EPAF 94-EPA Freshwater Cf Test Species:	CD-Ceriodaphnia dubia
Comments: BMDSA		

Dose-Response Plot



**Water Quality Summary for 7-day *Ceriodaphnia dubia*
Exposure to Benzene Monosulfonic Acid (BMSA)**

Initiated: 10 December 2002

Concentration	Lab Control							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.09	8.19	8.25	8.20	8.17	8.03	8.10	
DO (mg/L)	7.9	7.7	7.9	7.9	8.3	8.3	8.0	
Cond. (µmhos-cm)	192	20	199	194	194	197	212	
Temp (°C)	24.0	24.5	25.4	24.3	24.3	24.5	24.4	
Final								
pH		7.76	7.96	7.89	7.97	7.82	7.74	7.77
DO (mg/L)		7.3	8.2	8.2	8.3	7.8	8.0	7.5
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

Concentration	4,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.25	8.34	8.29	8.31	8.29	8.35	8.34	
DO (mg/L)	7.9	7.9	8.1	7.9	8.4	8.0	7.8	
Cond. (µmhos-cm)	1790	1812	1864	1811	1756	1700	1781	
Temp (°C)	24.0	24.6	26.0	24.9	24.1	24.3	25.4	
Final								
pH		7.99	8.13	8.09	8.10	8.14	8.15	8.00
DO (mg/L)		7.5	8.2	7.9	8.0	8.1	8.5	7.7
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

Concentration	500 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.12	8.08	8.29	8.28	8.25	8.16	8.21	
DO (mg/L)	7.9	7.8	7.8	7.9	8.3	8.0	8.0	
Cond. (µmhos-cm)	395	395	411	389	390	378	377	
Temp (°C)	24.0	24.5	26.0	24.4	24.3	24.5	24.6	
Final								
pH		7.87	8.02	7.97	8.03	7.96	7.96	7.88
DO (mg/L)		7.4	8.3	8.0	8.2	8.1	8.2	7.6
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

Concentration	8,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.23	8.32	8.27	8.29	8.29	NR	NR	
DO (mg/L)	7.9	8.0	8.1	8.0	8.4	NR	NR	
Cond. (µmhos-cm)	3280	3270	3390	3360	3190	NR	NR	
Temp (°C)	24.0	24.3	26.0	25.0	24.1	NR	NR	
Final								
pH		8.06	8.13	8.12	NR	NR	NR	NR
DO (mg/L)		7.7	8.2	8.1	NR	NR	NR	NR
Temp (°C)		24.2	24.1	24.6	NR	NR	NR	NR

Concentration	1,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.18	8.27	8.30	8.31	8.27	8.25	8.28	
DO (mg/L)	7.9	7.8	7.8	7.9	8.3	7.9	8.0	
Cond. (µmhos-cm)	601	612	648	605	584	586	587	
Temp (°C)	24.0	24.8	26.0	24.6	24.3	24.5	24.6	
Final								
pH		7.92	8.07	8.04	8.06	8.09	8.05	7.92
DO (mg/L)		7.4	8.2	8.0	8.2	8.1	8.4	7.7
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

Concentration	10,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.22	8.30	8.25	NR	NR	NR	NR	
DO (mg/L)	7.9	8.0	8.2	NR	NR	NR	NR	
Cond. (µmhos-cm)	4020	4020	4100	NR	NR	NR	NR	
Temp (°C)	24.0	24.1	25.5	NR	NR	NR	NR	
Final								
pH		8.09	8.11	NR	NR	NR	NR	NR
DO (mg/L)		7.8	8.2	NR	NR	NR	NR	NR
Temp (°C)		24.2	24.1	NR	NR	NR	NR	NR

Concentration	2,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.23	8.31	8.33	8.32	8.29	8.30	8.31	
DO (mg/L)	7.9	7.9	7.8	8.0	8.3	8.0	7.9	
Cond. (µmhos-cm)	971	1022	1075	1021	971	963	1004	
Temp (°C)	24.0	24.8	26.0	24.8	24.2	24.5	25.2	
Final								
pH		7.96	8.09	8.06	8.08	8.14	8.10	7.96
DO (mg/L)		7.3	8.2	8.0	8.0	8.1	8.2	7.7
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Notes: NR = not recorded because all organisms in that concentration were dead

Appendix TableC-3b.
Water Quality Summary for 7-day *Ceriodaphnia dubia*
Exposure to Benzene Monosulfonic Acid (BMSA)

Initiated: 10 December 2002

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
Lab Control	1	0	0	0	8	12	19	a	37
	2	0	0	7	0	14	16	a	37
	3	0	0	7	0	13	17	a	37
	4	0	0	5	0	11	18	a	34
	5	0	0	7	0	13	21	a	41
	6	0	0	6	11	0	21	a	38
	7	0	0	6	0	17	24	a	47
	8	0	0	6	12	0	22	a	40
	9	0	0	5	12	0	20	a	37
	10	0	0	0	6	14	15	a	35

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
2,000	1	0	0	4	0	9	18	a	31
	2	0	0	7	0	10	18	a	35
	3	0	0	6	9	3	19	a	37
	4	0	0	8	13	0	23	a	44
	5	0	0	3	9	0	12	a	24
	6	0	0	4	0	10	13	a	27
	7	0	0	3	9	0	18	a	30
	8	0	0	4	0	12	13	a	29
	9	0	0	2	10	0	11	a	23
	10	0	0	0	4	11	19	a	34

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
8,000	1	0	0/d	—	—	—	—	—	0/d
	2	0	0	0/d	—	—	—	—	0/d
	3	0	0	0/d	—	—	—	—	0/d
	4	0	0	0/d	—	—	—	—	0/d
	5	0	0/d	—	—	—	—	—	0/d
	6	0	0/d	—	—	—	—	—	0/d
	7	0	0/d	—	—	—	—	—	0/d
	8	0	0/d	—	—	—	—	—	0/d
	9	0	0	0/d	—	—	—	—	0/d
	10	0	0/d	—	—	—	—	—	0/d

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
500	1	0	0	0	8	12	16	a	36
	2	0	0	6	8	2	22	a	38
	3	0	0	5	12	0	21	a	38
	4	0	0	3	13	0	19	a	35
	5	0	0	6	0	11	21	a	38
	6	0	0	4	12	0	18	a	34
	7	0	0	6	11	0	21	a	38
	8	0	0	5	0	10	22	a	37
	9	0	0	4	14	0	21	a	39
	10	0	0	6	12	0	22	a	40

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
4,000	1	0	0	0	3	4	0	a	7
	2	0	0	3	0	4	2	a	9
	3	0	0	0	3	4	9	a	16
	4	0	0	0	0	0	3	a	3
	5	0	0	2	0	3	4	a	9
	6	0	0	5	10	0	5	a	20
	7	0	0	0/d	—	—	—	—	0/d
	8	0	LIP	—	—	—	—	—	LIP
	9	0	0	3	0	8	8	d	19
	10	0	0	4	9	0	9	d	22

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
10,000	1	0	0/d	—	—	—	—	—	0/d
	2	0	0/d	—	—	—	—	—	0/d
	3	0	0/d	—	—	—	—	—	0/d
	4	0	0/d	—	—	—	—	—	0/d
	5	0	0/d	—	—	—	—	—	0/d
	6	0	0/d	—	—	—	—	—	0/d
	7	0	0/d	—	—	—	—	—	0/d
	8	0	0/d	—	—	—	—	—	0/d
	9	0	0/d	—	—	—	—	—	0/d
	10	0	0/d	—	—	—	—	—	0/d

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
1,000	1	0	0	0	5	13	17	a	35
	2	0	0	3	0	10	19	a	32
	3	0	0	0	6	12	21	a	39
	4	0	0	3	13	0	17	a	33
	5	0	0	4	13	0	15	a	32
	6	0	0	7	12	0	20	a	39
	7	0	0	4	9	0	24	a	37
	8	0	0	3	10	0	11	a	24
	9	0	0	5	12	0	21	a	38
	10	0	0	5	0	12	15	a	32

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Notes: d = organism dead

a = organism alive, reproductive counts not taken because test acceptability criteria were met on day 6.

LIP = organism lost in process, excluded from statistical analysis

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

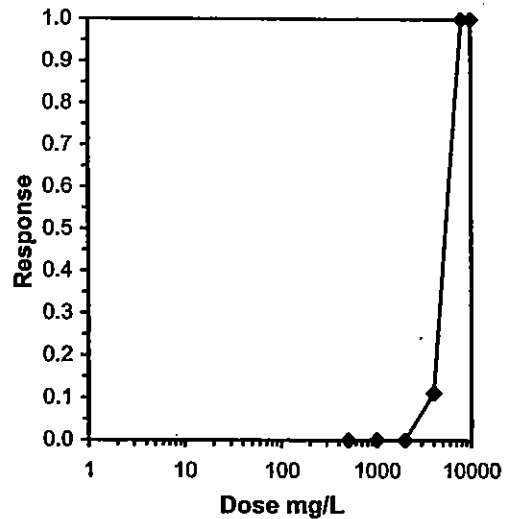
Start Date: 12/10/2002 Test ID: 0212-210 Sample ID: BEAZER
 End Date: 12/17/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: EPAF 94-EPA Freshwater Cf Test Species: CD-Ceriodaphnia dubia
 Comments: BMSA

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
L-Lab Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	
8000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-mg/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
L-Lab Control	1.0000	1.0000	0	10	10	10			0	10
500	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
1000	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
2000	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
4000	0.8889	0.8889	1	8	9	9	0.4737	0.0500	1	9
*8000	0.0000	0.0000	10	0	10	10	0.0000	0.0500	10	10
*10000	0.0000	0.0000	10	0	10	10	0.0000	0.0500	10	10

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	4000	8000	5656.85	

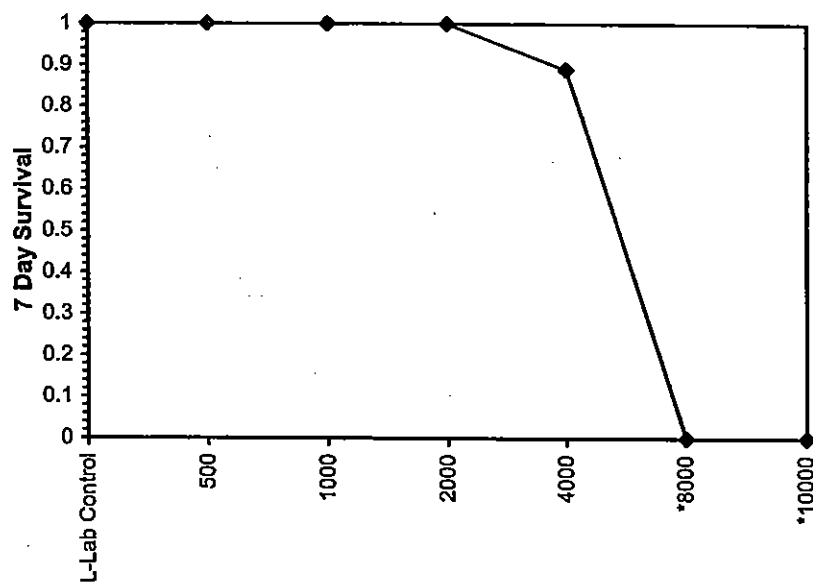
Trim Level	EC50	95% CL
0.0%	5237.54	4529.58 6056.15
5.0%	5356.02	4485.18 6395.94
10.0%	5414.74	4200.59 6979.83
20.0%	5417.02	4941.39 5938.43
Auto-0.0%	5237.54	4529.58 6056.15



Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date: 12/10/2002	Test ID: 0212-210	Sample ID: BEAZER
End Date: 12/17/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: EPAF 94-EPA Freshwater Cf	Test Species: CD-Ceriodaphnia dubia
Comments: BMSA		

Dose-Response Plot



Ceriodaphnia Survival and Reproduction Test-Reproduction

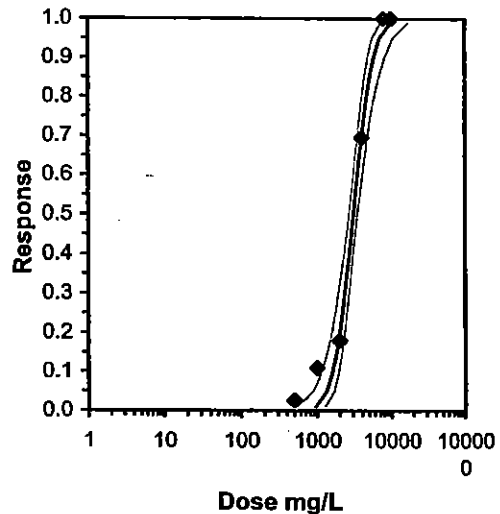
Start Date: 12/10/2002 Test ID: 0212-210 Sample ID: BEAZER
 End Date: 12/17/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: EPAF 94-EPA Freshwater Cf Test Species: CD-Ceriodaphnia dubia
 Comments: BMSA

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
L-Lab Control	37.000	37.000	37.000	34.000	41.000	38.000	47.000	40.000	37.000	35.000
500	36.000	38.000	38.000	35.000	38.000	34.000	38.000	37.000	39.000	40.000
1000	35.000	32.000	39.000	33.000	32.000	39.000	37.000	24.000	38.000	32.000
2000	31.000	35.000	37.000	44.000	24.000	27.000	30.000	29.000	23.000	34.000
4000	7.000	9.000	16.000	3.000	9.000	20.000	0.000	19.000	22.000	
8000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Conc-mg/L	Mean	N-Mean	Transform: Untransformed					Rank Sum	1-Tailed Critical	Mean	N-Mean
			Mean	Min	Max	CV%	N				
L-Lab Control	38.300	1.0000	38.300	34.000	47.000	9.617	10			38.300	0.0000
500	37.300	0.9739	37.300	34.000	40.000	4.903	10	103.50	73.00	37.300	0.0261
1000	34.100	0.8903	34.100	24.000	39.000	13.435	10	81.00	73.00	34.100	0.1097
*2000	31.400	0.8198	31.400	23.000	44.000	20.209	10	70.00	73.00	31.400	0.1802
*4000	11.667	0.3046	11.667	0.000	22.000	67.491	9	45.00	60.00	11.667	0.6954
*8000	0.000	0.0000	0.000	0.000	0.000	0.000	10	55.00	73.00	0.000	1.0000
*10000	0.000	0.0000	0.000	0.000	0.000	0.000	10	55.00	73.00	0.000	1.0000

Auxiliary Tests				Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)				1.52155	1.035	0.14608	1.89091
Equality of variance cannot be confirmed							
Hypothesis Test (1-tail, 0.05)				NOEC	LOEC	ChV	TU
Wilcoxon Rank Sum Test				1000	2000	1414.21	

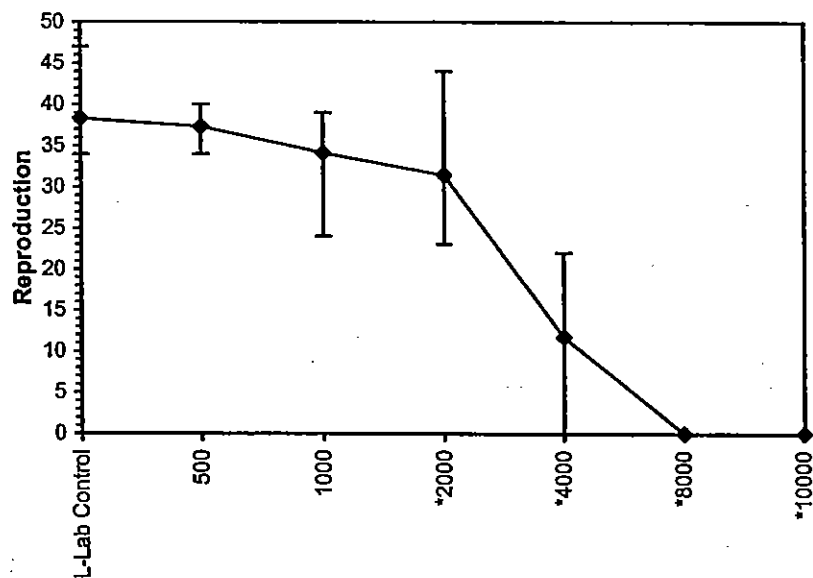
Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	4.58383	0.74427	3.12507	6.0426	0	3.86857	9.48773	0.42	3.48832	0.21816	7
Intercept	-10.99	2.59813	-16.082	-5.8975							
TSCR											
Point	Probits	mg/L	95% Fiducial Limits								
EC01	2.674	956.762	544.659	1292.45							
EC05	3.355	1347.34	893.206	1688.26							
EC10	3.718	1617.09	1159.5	1952.08							
EC15	3.964	1828.98	1379.8	2157.52							
EC20	4.158	2017.01	1581.27	2340.69							
EC25	4.326	2193.66	1773.73	2515.37							
EC40	4.747	2710.48	2334.53	3060.19							
EC50	5.000	3078.33	2709.43	3499.98							
EC60	5.253	3496.11	3096.48	4065.1							
EC75	5.674	4319.77	3764.17	5354.62							
EC80	5.842	4698.09	4044.38	6007.38							
EC85	6.036	5181.09	4387.14	6885.48							
EC90	6.282	5859.98	4848.29	8194.61							
EC95	6.645	7033.2	5605.34	10638.8							
EC99	7.326	9904.36	7321.35	17448.5							



Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 12/10/2002	Test ID: 0212-210	Sample ID: BEAZER
End Date: 12/17/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: EPAF 94-EPA Freshwater Cf Test Species:	CD-Ceriodaphnia dubia
Comments: BMSA		

Dose-Response Plot



**Water Quality Summary for 7-day *Ceriodaphnia dubia*
Exposure to P-Phenol Sulfonic Acid (PSA)**

Initiated: 10 December 2002

Concentration	Lab Control							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.09	8.19	8.08	8.21	8.13	8.14	8.10	
DO (mg/L)	7.9	7.7	8.1	7.9	8.4	7.9	8.0	
Cond. (µmhos-cm)	192	195	206	194	214	194	204	
Temp (°C)	24.0	24.5	25.2	24.6	24.0	24.3	24.5	
Final								
pH		7.92	7.91	7.95	7.91	7.99	7.98	7.76
DO (mg/L)		7.4	8.3	8.0	8.1	7.9	8.2	7.6
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

Concentration	4,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	7.12	7.10	7.23	7.10	7.14	7.12	7.14	
DO (mg/L)	7.8	7.9	8.1	7.8	8.4	7.8	7.7	
Cond. (µmhos-cm)	1387	1393	1452	1415	1390	1322	1392	
Temp (°C)	24.0	24.6	25.5	24.9	24.0	24.1	25.9	
Final								
pH		7.67	7.69	7.95	7.64	7.75	7.74	7.58
DO (mg/L)		7.2	8.2	8.0	7.4	24.3	8.0	7.2
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

Concentration	500 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	7.57	7.63	7.75	7.65	7.53	7.59	7.69	
DO (mg/L)	7.9	7.8	8.1	7.9	8.3	7.9	7.8	
Cond. (µmhos-cm)	346	337	354	341	459	335	334	
Temp (°C)	24.0	24.7	25.6	24.6	24.2	24.3	24.8	
Final								
pH		7.99	7.95	8.01	7.89	8.04	8.10	7.77
DO (mg/L)		7.3	8.3	8.0	8.0	7.9	8.0	7.4
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

Concentration	8,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	6.94	6.92	7.02	6.91	6.98	NR	NR	
DO (mg/L)	7.9	7.9	8.2	7.9	8.4	NR	NR	
Cond. (µmhos-cm)	2500	2500	2580	2530	2380	NR	NR	
Temp (°C)	24.0	24.3	25.4	25.0	24.0	NR	NR	
Final								
pH		7.44	7.49	7.42	NR	NR	NR	NR
DO (mg/L)		7.4	8.3	8.0	NR	NR	NR	NR
Temp (°C)		24.2	24.1	24.6	NR	NR	NR	NR

Concentration	1,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	7.44	7.45	7.59	7.48	7.49	7.40	7.49	
DO (mg/L)	7.9	7.8	7.8	7.8	8.3	7.9	7.8	
Cond. (µmhos-cm)	504	513	524	504	489	484	494	
Temp (°C)	24.0	24.9	25.8	24.9	24.2	24.3	24.8	
Final								
pH		7.95	7.92	8.00	7.87	8.02	7.91	7.76
DO (mg/L)		7.4	8.3	8.0	7.8	7.9	7.9	7.4
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

Concentration	10,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	6.85	6.84	6.94	6.83	6.89	NR	NR	
DO (mg/L)	7.8	8.0	8.2	8.0	8.5	NR	NR	
Cond. (µmhos-cm)	3060	3050	3160	3110	3000	NR	NR	
Temp (°C)	24.0	24.0	25.2	24.9	24.0	NR	NR	
Final								
pH		7.36	7.37	7.32	7.53	NR	NR	NR
DO (mg/L)		7.7	8.4	8.0	8.5	NR	NR	NR
Temp (°C)		24.2	24.1	24.6	24.2	NR	NR	NR

Concentration	2,000 mg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	7.30	7.29	7.42	7.29	7.33	7.31	7.32	
DO (mg/L)	7.9	7.8	8.1	7.8	8.3	7.9	7.8	
Cond. (µmhos-cm)	793	815	845	809	788	785	807	
Temp (°C)	24.0	24.9	25.8	24.9	24.1	24.3	25.3	
Final								
pH		7.86	7.84	7.90	7.68	7.91	7.76	7.67
DO (mg/L)		7.5	8.3	7.9	7.0	7.9	7.7	7.1
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Notes: NR = not recorded because all organisms in that concentration were dead

Appendix Table C-3a.
Water Quality Summary for 7-day *Ceriodaphnia dubia*
Exposure to P-Phenol Sulfonic Acid (PSA)

Initiated: 10 December 2002

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
Lab Control	1	0	0	0	6	14	23	a	43
	2	0	0	3	6	12	23	a	44
	3	0	0	0	0	11	19	a	30
	4	0	0	5	0	12	22	a	39
	5	0	0	0	9	16	20	a	45
	6	0	0	4	0	13	21	a	38
	7	0	0	3	0	14	22	a	39
	8	0	0	0	0	12	24	a	36
	9	0	0	0	7	12	6	a	25
	10	0	0	5	0	14	15	a	34

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
2,000	1	0	0	0	0	0	0	a	0
	2	0	0	0	0	0	0	a	0
	3	0	0	0	0	0	0	a	0
	4	0	0	0	0	0	0	a	0
	5	0	0	0	0	0	0	a	0
	6	0	0	0	0	0	0	a	0
	7	0	0	0	0	0	0	a	0
	8	0	0	0	0	0	0	a	0
	9	0	0	0	0	0	0	a	0
	10	0	0	0	0	0	0	a	0

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
8,000	1	0	0	0	0/d	--	--	--	0/d
	2	0	0	0/d	--	--	--	--	0/d
	3	0	0	0/d	--	--	--	--	0/d
	4	0	0	0/d	--	--	--	--	0/d
	5	0	0	0/d	--	--	--	--	0/d
	6	0	0	0/d	--	--	--	--	0/d
	7	0	0	0/d	--	--	--	--	0/d
	8	0	0	0/d	--	--	--	--	0/d
	9	0	0	0/d	--	--	--	--	0/d
	10	0	0	0/d	--	--	--	--	0/d

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
500	1	0	0	0	6	14	14	a	34
	2	0	0	6	0	14	20	a	40
	3	0	0	6	7	17	15	a	45
	4	0	0	6	9	0	14	a	29
	5	0	0	6	12	0	21	a	39
	6	0	0	0	0	4	15	a	19
	7	0	0	7	7	13	8	a	35
	8	0	0	6	12	0	24	a	42
	9	0	0	2	7	13	18	a	40
	10	0	0	1	6	13	22	a	42

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
4,000	1	0	0	0	0	0	0	a	0
	2	0	0	0	0	0	0	a	0
	3	0	0	0	0	0	0	a	0
	4	0	0	0	0	0	0	a	0
	5	0	0	0	0	0	0	d	0/d
	6	0	0	0	0	0	0	a	0
	7	0	0	0	0	0	0	a	0
	8	0	0	0	0	0	0	a	0
	9	0	0	0	0	0	0	a	0
	10	0	0	0	0	0	0	a	0

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
10,000	1	0	0	0/d	--	--	--	--	0/d
	2	0	0	0/d	--	--	--	--	0/d
	3	0	0/d	--	--	--	--	--	0/d
	4	0	0	0/d	--	--	--	--	0/d
	5	0	0	0/d	--	--	--	--	0/d
	6	0	0	0/d	--	--	--	--	0/d
	7	0	0	0/d	--	--	--	--	0/d
	8	0	0/d	--	--	--	--	--	0/d
	9	0	0/d	--	--	--	--	--	0/d
	10	0	0/d	--	--	--	--	--	0/d

Conc. (mg/L)	Rep	Daily Reproduction/ Survival							Total
		1	2	3	4	5	6	7	
1,000	1	0	0	0	0	7	10	a	17
	2	0	0	0	0	9	1	a	10
	3	0	0	2	0	7	14	a	23
	4	0	0	4	0	6	8	a	18
	5	0	0	0	5	4	14	a	23
	6	0	0	3	8	0	10	a	21
	7	0	0	3	0	11	17	a	31
	8	0	0	3	7	0	13	a	23
	9	0	0	0	6	5	7	a	18
	10	0	0	0	5	4	8	a	17

AMEC Bioassay Laboratory - 6550 Morehouse Dr., Suite B San Diego, CA 92121.

Notes: d = organism dead

a = organism alive, reproductive counts not taken because test acceptability criteria were met on day 6.

LIP = organism lost in process, excluded from statistical analysis

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

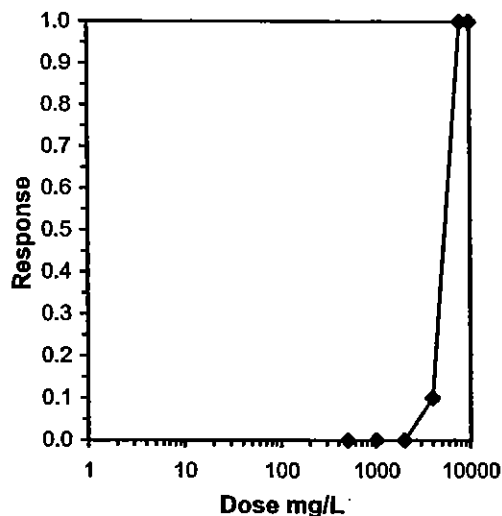
Start Date: 12/10/2002 Test ID: 0212-208 Sample ID: BEAZER
 End Date: 12/17/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: EPAF 94-EPA Freshwater Cf Test Species: CD-Ceriodaphnia dubia
 Comments: PSA

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
L-Lab Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-mg/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
L-Lab Control	1.0000	1.0000	0	10	10	10			0	10
500	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
1000	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
2000	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
4000	0.9000	0.9000	1	9	10	10	0.5000	0.0500	1	10
*8000	0.0000	0.0000	10	0	10	10	0.0000	0.0500	10	10
*10000	0.0000	0.0000	10	0	10	10	0.0000	0.0500	10	10

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	4000	8000	5656.85	

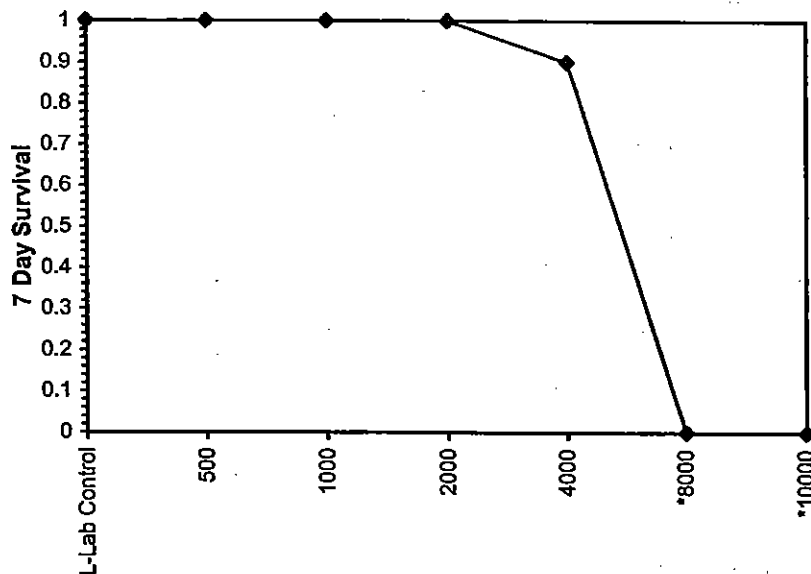
Trimmed Spearman-Kärber			
Trim Level	EC50	95% CL	
0.0%	5278.03	4627.6	6019.89
5.0%	5396.78	4579.7	6359.64
10.0%	5443.16	5018.73	5903.48
20.0%	5443.16	5018.73	5903.48
Auto-0.0%	5278.03	4627.6	6019.89



Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date: 12/10/2002	Test ID: 0212-208	Sample ID: BEAZER
End Date: 12/17/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: EPAF 94-EPA Freshwater Ct	Test Species: CD-Ceriodaphnia dubia
Comments: PSA		

Dose-Response Plot



Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 12/10/2002 Test ID: 0212-208 Sample ID: BEAZER
 End Date: 12/17/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: EPAF 94-EPA Freshwater Cf Test Species: CD-Ceriodaphnia dubia
 Comments: PSA

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
L-Lab Control	43.000	44.000	30.000	40.000	45.000	38.000	39.000	36.000	25.000	34.000
500	34.000	40.000	45.000	29.000	39.000	19.000	35.000	42.000	40.000	42.000
1000	17.000	10.000	23.000	18.000	23.000	21.000	31.000	23.000	18.000	17.000
2000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Conc-mg/L	Mean	N-Mean	Transform: Untransformed					Rank Sum	1-Tailed Critical	Mean	N-Mean
			Mean	Min	Max	CV%	N				
L-Lab Control	37.400	1.0000	37.400	25.000	45.000	17.014	10			37.400	0.0000
500	36.500	0.9759	36.500	19.000	45.000	21.113	10	103.50	74.00	36.500	0.0241
*1000	20.100	0.5374	20.100	10.000	31.000	27.496	10	57.00	74.00	20.100	0.4626
*2000	0.000	0.0000	0.000	0.000	0.000	0.000	10	55.00	74.00	0.000	1.0000
*4000	0.000	0.0000	0.000	0.000	0.000	0.000	10	55.00	74.00	0.000	1.0000
*8000	0.000	0.0000	0.000	0.000	0.000	0.000	10	55.00	74.00	0.000	1.0000
*10000	0.000	0.0000	0.000	0.000	0.000	0.000	10	55.00	74.00	0.000	1.0000

Auxiliary Tests

Kolmogorov D Test indicates non-normal distribution ($p \leq 0.01$) Statistic: 2.65829 Critical: 1.035 Skew: -1.2591 Kurt: 5.73658

Equality of variance cannot be confirmed

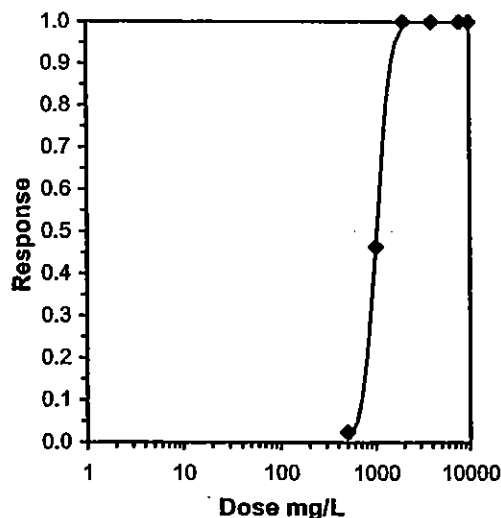
Hypothesis Test (1-tail, 0.05) NOEC LOEC ChV TU

Steel's Many-One Rank Test 500 1000 707.107

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	7.88207	4.49574	-0.9296	16.6937	0	0.18619	9.48773	1	3.01139	0.12687	5
Intercept	-18.736	13.492	-45.18	7.70832							

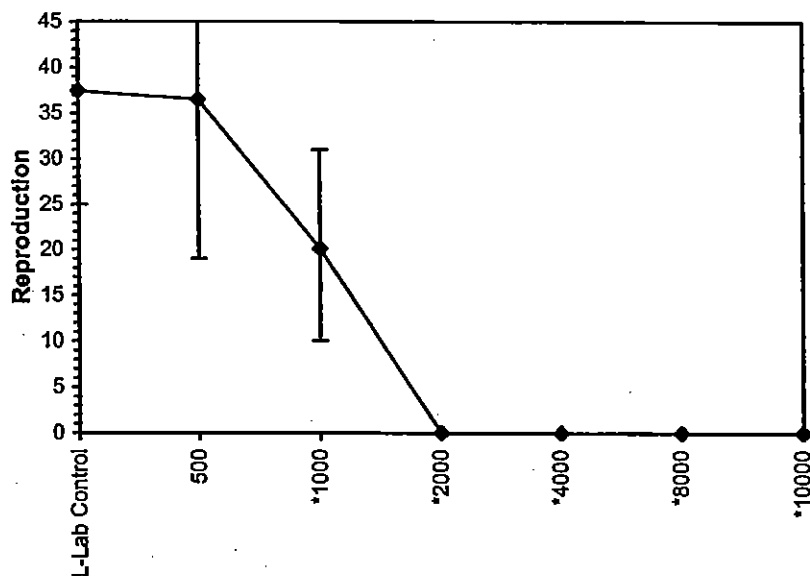
Point	Probits	mg/L	95% Fiducial Limits
EC01	2.674	520.29	
EC05	3.355	634.902	
EC10	3.718	705.991	
EC15	3.964	758.398	
EC20	4.158	802.811	
EC25	4.326	842.98	
EC40	4.747	953.339	
EC50	5.000	1026.57	
EC60	5.253	1105.43	
EC75	5.674	1250.15	
EC80	5.842	1312.7	
EC85	6.036	1389.58	
EC90	6.282	1492.73	
EC95	6.645	1659.86	
EC99	7.326	2025.51	



Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 12/10/2002	Test ID: 0212-208	Sample ID: BEAZER
End Date: 12/17/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: EPAF 94-EPA Freshwater Ct Test Species:	CD-Ceriodaphnia dubia
Comments: PSA		

Dose-Response Plot



Pimephales promelas

Appendix Table C-4a.

**Water Quality Summary for 96-hour *Pimephales promelas*
Exposure to Benzene Metadisulfonic Acid (BMDSA)**

Initiated: 10 December 2002

Concentration (mg/L)	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)			Temperature (°C)					Percent Survival
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	48	96	0	24	48	72	96	
Lab Control	A	10	10	9	9	9	7.9	8.0	7.7	6.6	8.1	8.09	7.20	7.21	7.21	7.45	192	196	207	20.2	20.3	20.0	20.5	19.8	90
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
500	A	10	10	10	10	10	7.9	7.7	7.6	6.6	8.2	8.21	7.61	7.40	7.41	7.64	494	452	475	20.2	20.2	20.0	20.2	19.8	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
1,000	A	10	10	10	10	10	7.9	7.6	7.8	6.6	8.1	8.25	7.71	7.55	7.65	7.69	731	731	762	20.2	20.2	20.1	20.2	19.8	100
	B	10	10	9	9	8																			80
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
2,000	A	10	10	10	10	10	7.9	7.7	7.8	6.6	8.0	8.26	7.77	7.65	7.75	7.78	1375	1269	1304	20.2	20.1	20.2	20.1	19.8	100
	B	10	10	10	10	10																			100
	C	10	10	9	9	9																			90
	D	10	10	10	10	10																			100
4,000	A	10	10	10	10	10	7.9	7.7	7.4	6.8	8.0	8.26	7.78	7.70	7.81	7.79	2490	2280	2350	20.2	20.1	20.2	20.0	19.8	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
8,000	A	10	10	10	10	10	7.9	7.9	7.3	6.6	8.0	8.25	7.83	7.69	7.87	7.82	4720	4310	4440	20.2	20.0	20.1	19.9	19.8	100
	B	10	10	10	10	10																			100
	C	10	9	9	9	9																			90
	D	10	10	10	10	10																			100
10,000	A	10	10	10	10	10	7.9	8.1	7.9	6.6	8.0	8.24	7.82	7.71	7.85	7.81	5100	5300	5700	20.2	20.0	20.0	19.9	19.8	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100

Acute Fish Test-96 Hr Survival

Start Date: 12/10/2002 Test ID: 0212-132 Sample ID: BEAZER
 End Date: 12/14/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: EPAA 93-EPA Acute Test Species: PP-Pimephales promelas
 Comments: BMDSA

Conc-mg/L	1	2	3	4
L-Lab Control	0.9000	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000	1.0000
1000	1.0000	0.8000	1.0000	1.0000
2000	1.0000	1.0000	0.9000	1.0000
4000	1.0000	1.0000	1.0000	1.0000
8000	1.0000	1.0000	0.9000	1.0000
10000	1.0000	1.0000	1.0000	1.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%	N			Mean	N-Mean
L-Lab Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4			0.9875	1.0000
500	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0.9875	1.0000
1000	0.9500	0.9744	1.3358	1.1071	1.4120	11.411	4	17.50	10.00	0.9800	0.9924
2000	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	18.00	10.00	0.9800	0.9924
4000	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0.9800	0.9924
8000	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	18.00	10.00	0.9800	0.9924
10000	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0.9800	0.9924

Auxiliary Tests

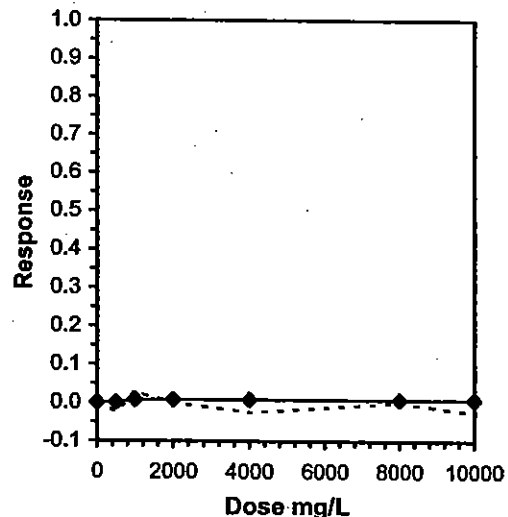
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$) Statistic 0.75123 Critical 0.896 Skew -1.8614 Kurt 3.7366
 Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05) NOEC LOEC ChV TU

Steel's Many-One Rank Test 10000 >10000

Linear Interpolation (200 Resamples)

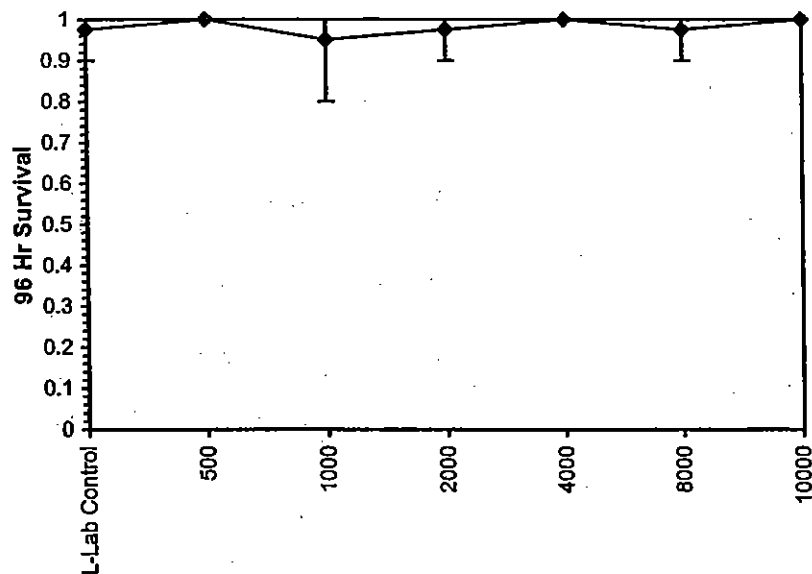
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Acute Fish Test-96 Hr Survival

Start Date:	12/10/2002	Test ID:	0212-132	Sample ID:	BEAZER
End Date:	12/14/2002	Lab ID:	AEESD-AMEC Bioassay SD	Sample Type:	Industrial Product
Sample Date:		Protocol:	EPAA 93-EPA Acute	Test Species:	PP-Pimephales promelas
Comments:	BMDSA				

Dose-Response Plot



Appendix Table C-4b.
Water Quality Summary for 96-hour *Pimephales promelas*
Exposure to Benzene Monosulfonic Acid (BMSA)

Initiated: 10 December 2002

Concentration (mg/L)	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)			Temperature (°C)					Percent Survival
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	48	96	0	24	48	72	96	
Lab Control	A	10	10	10	10	10	7.9	7.8	7.9	6.5	8.1	8.09	7.26	7.44	7.50	7.42	192	221	230	20.2	20.2	20.1	20.3	19.8	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	9																			90
500	A	10	10	10	10	10	7.9	7.8	7.3	6.6	8.1	8.12	7.38	7.57	7.62	7.62	395	383	399	20.2	20.2	20.1	20.2	19.8	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
1,000	A	10	10	10	10	10	7.9	7.4	7.4	6.5	8.0	8.18	7.56	7.68	7.71	7.69	601	562	587	20.2	20.2	20.0	20.1	19.8	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
2,000	A	10	10	10	10	9	7.9	7.7	7.9	6.5	8.0	8.23	7.69	7.57	7.75	7.75	971	886	920	20.2	20.0	20.0	20.0	19.8	90
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
4,000	A	10	10	10	10	10	7.9	7.8	7.7	6.5	8.1	8.25	7.75	7.65	7.80	7.80	1790	1616	1660	20.2	20.1	20.0	20.0	19.8	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
8,000	A	10	10	10	10	10	7.9	8.1	7.8	6.6	8.0	8.23	7.80	7.60	7.85	7.82	3280	2990	3140	20.2	20.0	20.1	20.0	19.8	100
	B	10	10	10	10	10																			100
	C	10	9	9	9	9																			90
	D	10	10	10	10	10																			100
10,000	A	10	9	9	9	9	7.9	8.0	8.1	6.7	8.0	8.22	7.80	7.73	7.85	7.82	4020	3700	3990	20.2	19.8	20.0	20.0	19.8	90
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100

Acute Fish Test-96 Hr Survival

Start Date: 12/10/2002 Test ID: 0212-133 Sample ID: BEAZER
 End Date: 12/14/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: EPAA 93-EPA Acute Test Species: PP-Pimephales promelas
 Comments: BMSA

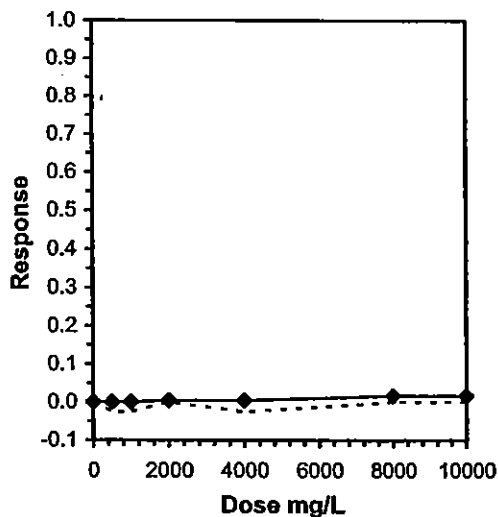
Conc-mg/L	1	2	3	4
L-Lab Control	1.0000	1.0000	1.0000	0.9000
500	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000
2000	0.9000	1.0000	1.0000	1.0000
4000	1.0000	1.0000	1.0000	1.0000
8000	1.0000	1.0000	0.9000	1.0000
10000	0.9000	1.0000	1.0000	1.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%	N			Mean	N-Mean
L-Lab Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4			0.9917	1.0000
500	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0.9917	1.0000
1000	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0.9917	1.0000
2000	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	18.00	10.00	0.9875	0.9958
4000	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0.9875	0.9958
8000	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	18.00	10.00	0.9750	0.9832
10000	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	18.00	10.00	0.9750	0.9832

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.66932	0.896	-1.6154	1.55423
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	10000	>10000		

Linear Interpolation (200 Resamples)

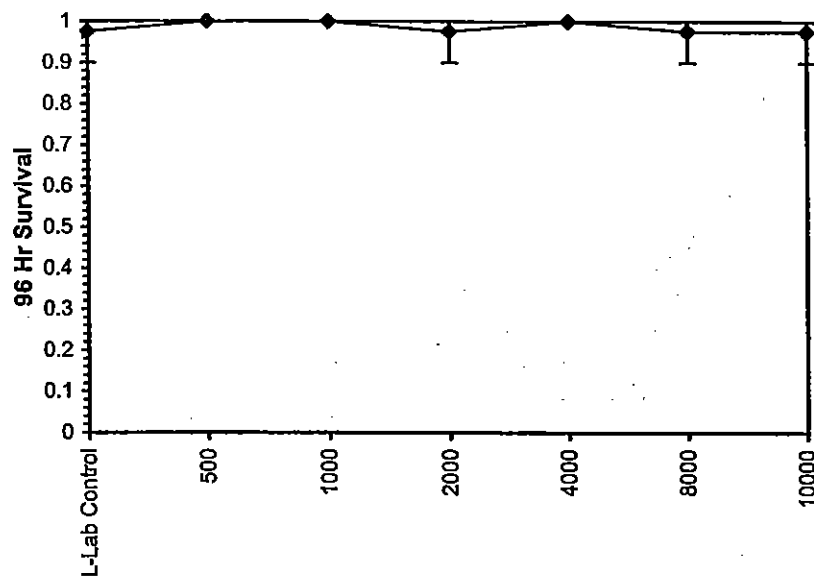
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Acute Fish Test-96 Hr Survival

Start Date:	12/10/2002	Test ID:	0212-133	Sample ID:	BEAZER
End Date:	12/14/2002	Lab ID:	AEESD-AMEC Bioassay SD	Sample Type:	Industrial Product
Sample Date:		Protocol:	EPAA 93-EPA Acute	Test Species:	PP-Pimephales promelas
Comments:	BMSA				

Dose-Response Plot



Appendix Table C-4c.

**Water Quality Summary for 96-hour *Pimephales promelas*
Exposure to P-Phenol Sulfonic Acid (PSA)**

Initiated: 10 December 2002

Concentration (mg/L)	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)			Temperature (°C)					Percent Survival
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	48	96	0	24	48	72	96	
Lab Control	A	10	10	10	10	10	7.9	7.8	8.0	6.4	8.1	8.09	7.61	7.87	8.37	7.98	192	188	207	20.2	20.2	20.2	20.3	19.8	100
	B	10	10	10	10	10																			100
	C	10	9	8	8	8																			80
	D	10	10	10	10	10																			100
500	A	10	10	10	10	10	7.9	7.9	7.7	7.0	8.1	7.57	7.76	7.75	8.17	7.92	346	326	345	20.2	20.2	20.0	20.2	19.8	100
	B	10	9	9	9	9																			90
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
1,000	A	10	10	10	10	10	7.9	7.8	7.7	6.8	8.0	7.44	7.70	7.88	8.11	7.81	504	468	491	20.1	20.1	20.0	20.2	19.8	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
2,000	A	10	10	10	10	10	7.9	8.1	7.5	6.8	7.8	7.30	7.64	7.65	8.01	7.73	793	732	759	20.0	20.0	20.0	20.2	19.8	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	9	9	9																			90
4,000	A	10	10	10	10	10	7.8	7.9	7.3	6.6	8.0	7.10	7.49	7.54	7.86	7.61	1415	1261	1312	19.9	19.9	20.0	20.1	19.8	100
	B	10	10	9	9	9																			90
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
8,000	A	10	10	9	9	9	7.9	7.9	7.7	6.5	7.8	6.94	7.30	7.37	7.64	7.40	2500	2250	2350	19.9	19.9	20.0	20.0	19.8	90
	B	10	10	10	10	10																			100
	C	10	10	9	9	8																			80
	D	10	10	10	10	10																			100
10,000	A	10	10	9	9	9	7.8	8.0	8.0	6.7	8.0	6.85	7.24	7.33	7.52	7.31	3060	2790	2980	20.0	19.8	20.0	19.8	19.8	90
	B	10	10	10	10	10																			100
	C	10	10	9	9	8																			80
	D	10	10	10	10	10																			100

Acute Fish Test-96 Hr Survival

Start Date: 12/10/2002 Test ID: 0212-131 Sample ID: BEAZER
 End Date: 12/14/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: EPAA 93-EPA Acute Test Species: PP-Pimephales promelas
 Comments: PSA

Conc-mg/L	1	2	3	4
L-Lab Control	1.0000	1.0000	0.8000	1.0000
500	1.0000	0.9000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000
2000	1.0000	1.0000	1.0000	0.9000
4000	1.0000	0.9000	1.0000	1.0000
8000	0.9000	1.0000	0.8000	1.0000
10000	0.9000	1.0000	0.8000	1.0000

Conc-mg/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N			Mean	N-Mean
L-Lab Control	0.9500	1.0000	1.3358	1.1071	1.4120	11.411	4			0.9750	1.0000
500	0.9750	1.0263	1.3713	1.2490	1.4120	5.942	4	18.50	10.00	0.9750	1.0000
1000	1.0000	1.0526	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0.9750	1.0000
2000	0.9750	1.0263	1.3713	1.2490	1.4120	5.942	4	18.50	10.00	0.9750	1.0000
4000	0.9750	1.0263	1.3713	1.2490	1.4120	5.942	4	18.50	10.00	0.9750	1.0000
8000	0.9250	0.9737	1.2951	1.1071	1.4120	11.347	4	16.50	10.00	0.9250	0.9487
10000	0.9250	0.9737	1.2951	1.1071	1.4120	11.347	4	16.50	10.00	0.9250	0.9487

Auxiliary Tests

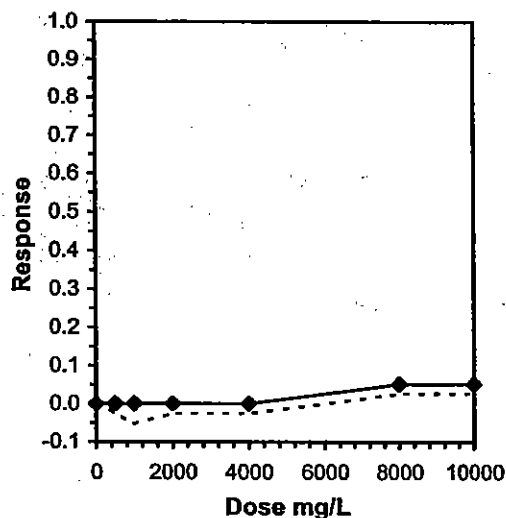
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01) Statistic: 0.87287 Critical: 0.896 Skew: -0.9576 Kurt: 0.04343
 Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05) NOEC LOEC ChV TU

Steel's Many-One Rank Test 10000 >10000

Linear Interpolation (200 Resamples)

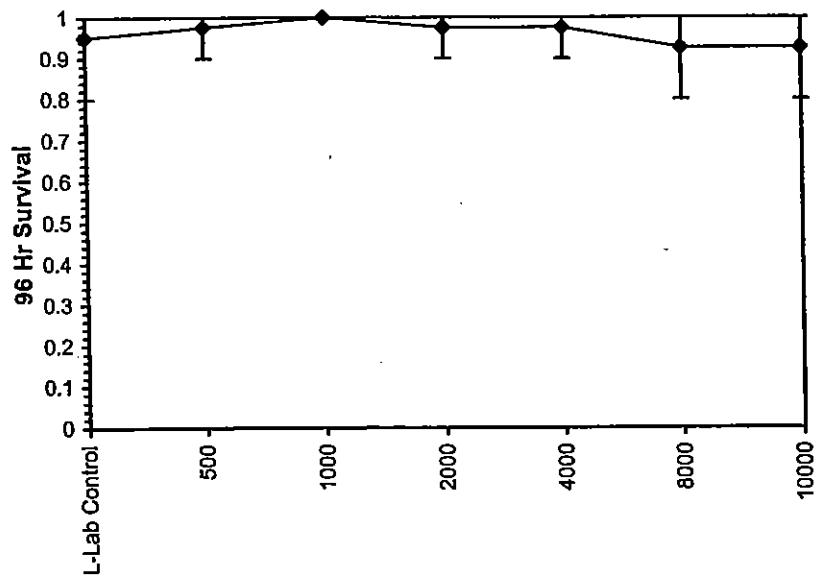
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	7900			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Acute Fish Test-96 Hr Survival

Start Date: 12/10/2002	Test ID: 0212-131	Sample ID: BEAZER
End Date: 12/14/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: EPAA 93-EPA Acute	Test Species: PP-Pimephales promelas
Comments: PSA		

Dose-Response Plot



Hyaella azteca

Appendix Table C-5a.

**Water Quality Summary for 96-hour *Hyalomma azteca*
Exposure to Benzene Metadisulfonic Acid (BMDSA)**

Initiated: 12 December 2002

Concentration (mg/L)	Rep	No. Live Organisms		Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Percent Survival
		0	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
Lab Control	A	10	10	8.8	6.0	5.8	6.5	6.6	7.74	7.58	7.53	7.79	7.65	823	811	810	809	811	20.2	20.3	20.1	20.0	20.0	100
	B	10	10																					100
	C	10	10																					100
	D	10	10																					100
	E	10	9																					90
500	A	10	10	8.0	4.5	5.2	5.9	6.0	7.82	7.60	7.54	7.78	7.73	1095	1095	1095	1096	1100	20.4	20.7	20.1	20.0	20.0	100
	B	10	10																					100
	C	10	8																					80
	D	10	10																					100
	E	10	10																					100
1,000	A	10	10	8.3	4.9	6.0	6.3	6.6	7.87	7.64	7.61	7.82	7.82	1352	1348	1346	1349	1354	20.3	20.3	20.0	20.0	20.0	100
	B	10	10																					100
	C	10	10																					100
	D	10	10																					100
	E	10	10																					100
2,000	A	10	10	8.5	4.5	5.5	6.0	6.4	7.94	7.67	7.60	7.83	7.81	1872	1875	1871	1873	1879	20.0	20.3	20.0	20.0	20.0	100
	B	10	10																					100
	C	10	10																					100
	D	10	10																					100
	E	10	10																					100
4,000	A	10	10	8.5	5.1	6.5	6.1	6.7	7.98	7.68	7.65	7.87	7.85	2860	2860	2850	2850	2850	20.1	20.3	20.0	20.0	20.0	100
	B	10	10																					100
	C	10	10																					100
	D	10	10																					100
	E	10	10																					100
8,000	A	10	10	8.6	4.1	3.8	5.0	6.0	7.99	7.71	7.56	7.85	7.82	4800	4790	4770	4760	4770	19.9	20.3	20.0	20.0	20.0	100
	B	10	10																					100
	C	10	10																					100
	D	10	10																					100
	E	10	9																					90
10,000	A	10	10	8.6	6.0	6.0	4.5	6.5	7.97	7.69	7.59	7.70	7.81	5730	5680	5670	5670	5690	20.2	20.3	20.0	19.9	20.0	100
	B	10	10																					100
	C	10	9																					90
	D	10	7																					70
	E	10	10																					100

Amphipod 96-Hr Survival Bioassay-96 Hr Survival

Start Date: 12/12/2002	Test ID: 0212-135	Sample ID: BEAZER
End Date: 12/16/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: ASTM 1999	Test Species: HA-Hyaella azteca
Comments: BMDSA		

Conc-mg/L	1	2	3	4	5
L-Lab Control	1.0000	1.0000	1.0000	1.0000	0.9000
500	1.0000	1.0000	0.8000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000	1.0000
2000	1.0000	1.0000	1.0000	1.0000	1.0000
4000	1.0000	1.0000	1.0000	1.0000	1.0000
8000	1.0000	1.0000	1.0000	1.0000	0.9000
10000	1.0000	1.0000	0.9000	0.7000	1.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Number Resp	Total Number
			Mean	Min	Max	CV%	N				
L-Lab Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5			1	50
500	0.9600	0.9796	1.3510	1.1071	1.4120	10.092	5	27.00	16.00	2	50
1000	1.0000	1.0204	1.4120	1.4120	1.4120	0.000	5	30.00	16.00	0	50
2000	1.0000	1.0204	1.4120	1.4120	1.4120	0.000	5	30.00	16.00	0	50
4000	1.0000	1.0204	1.4120	1.4120	1.4120	0.000	5	30.00	16.00	0	50
8000	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5	27.50	16.00	1	50
10000	0.9200	0.9388	1.2953	0.9912	1.4120	14.210	5	24.50	16.00	4	50

Auxillary Tests

Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	Statistic	Critical	Skew	Kurt
	0.75361	0.91	-2.0098	5.18425

Equality of variance cannot be confirmed

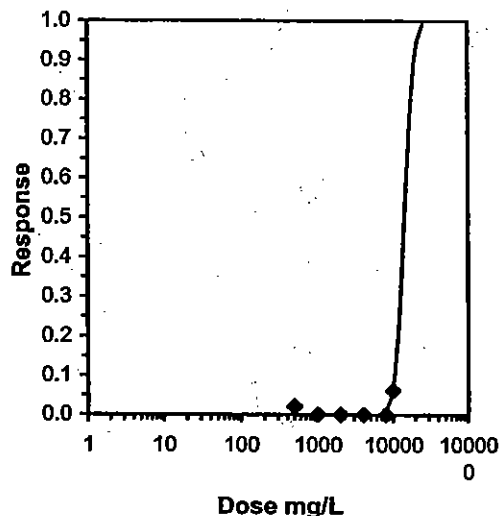
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
---------------------------------------	-------------	-------------	------------	-----------

Steel's Many-One Rank Test	10000	>10000
----------------------------	-------	--------

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits	Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	9.49322	10.1447	-10.39 29.3769	0.02	5.12816	9.48773	0.27	4.15638	0.10534	6
Intercept	-34.457	40.4863	-113.81 44.8957							
TSCR	0.012	0.00689	-0.0015 0.0255							

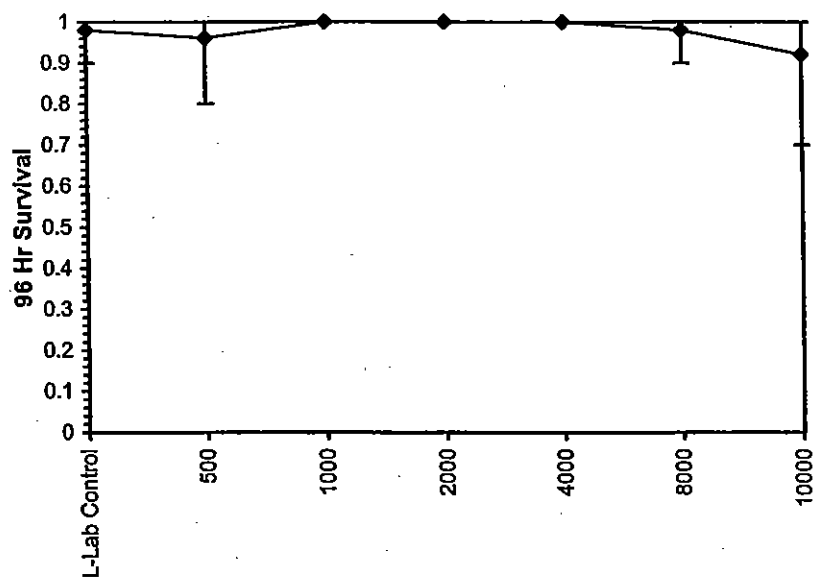
Point	Probits	mg/L	95% Fiducial Limits
EC01	2.674	8153.24	
EC05	3.355	9618.73	
EC10	3.718	10504.8	
EC15	3.964	11148.3	
EC20	4.158	11687.7	
EC25	4.326	12171.2	
EC40	4.747	13480.2	
EC50	5.000	14334.5	
EC60	5.253	15243	
EC75	5.674	16882.4	
EC80	5.842	17580.8	
EC85	6.036	18431.5	
EC90	6.282	19560.5	
EC95	6.645	21362.4	
EC99	7.326	25202.1	



Amphipod 96-Hr Survival Bioassay-96 Hr Survival

Start Date:	12/12/2002	Test ID:	0212-135	Sample ID:	BEAZER
End Date:	12/16/2002	Lab ID:	AEESD-AMEC Bioassay SD	Sample Type:	Industrial Product
Sample Date:		Protocol:	ASTM 1999	Test Species:	HA-Hyaella azteca
Comments:	BMDSA				

Dose-Response Plot



Appendix Table C-5b.
Water Quality Summary for 96-hour *Hyalomma azteca*
Exposure to Benzene Monosulfonic Acid (BMSA)

Initiated: 12 December 2002

Concentration (mg/L)	Rep	No. Live Organisms		Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Percent Survival
		0	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
Lab Control	A	10	10	8.8	6.0	5.8	6.5	6.6	7.74	7.58	7.53	7.79	7.65	823	811	810	809	811	20.2	20.3	20.1	20.0	20.0	100
	B	10	10																					100
	C	10	10																					100
	D	10	10																					100
	E	10	9																					90
500	A	10	10	8.0	5.2	6.6	6.2	6.7	7.74	7.52	7.42	7.51	7.66	1011	1170	996	999	1001	20.6	20.2	20.1	20.0	20.0	100
	B	10	10																					100
	C	10	10																					100
	D	10	10																					100
	E	10	10																					100
1,000	A	10	10	8.1	5.0	6.2	6.4	6.7	7.79	7.57	7.54	7.64	7.79	1182	1508	1171	1175	1179	20.6	20.1	20.0	19.9	19.9	100
	B	10	10																					100
	C	10	10																					100
	D	10	10																					100
	E	10	10																					100
2,000	A	10	10	8.0	4.0	6.4	6.1	6.9	7.83	7.53	7.58	7.69	7.80	1529	1780	1513	1517	1520	20.5	20.0	19.9	19.9	19.8	100
	B	10	10																					100
	C	10	10																					100
	D	10	10																					100
	E	10	10																					100
4,000	A	10	9	8.2	4.1	4.0	4.2	5.0	7.87	7.67	7.48	7.66	7.73	2230	2200	2210	2210	2220	20.5	20.0	19.8	19.9	19.9	90
	B	10	10																					100
	C	10	9																					90
	D	10	10																					100
	E	10	10																					100
8,000	A	10	10	8.2	5.0	6.3	6.1	6.5	7.89	7.59	7.60	7.58	7.12	3540	3510	3510	3500	3510	20.3	20.1	19.9	20.0	20.1	100
	B	10	10																					100
	C	10	10																					100
	D	10	9																					90
	E	10	10																					100
10,000	A	10	9	8.7	5.7	6.8	5.9	6.6	7.42	7.59	7.62	7.68	7.43	4240	4190	4200	4200	4210	20.3	20.1	20.0	20.0	20.1	90
	B	10	8																					80
	C	10	7																					70
	D	10	7																					70
	E	10	10																					100

Amphipod 96-Hr Survival Bioassay-96 Hr Survival

Start Date: 12/12/2002	Test ID: 0212-136	Sample ID: BEAZER
End Date: 12/16/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: ASTM 1999	Test Species: HA-Hyalella azteca
Comments: BMSA		

Conc-mg/L	1	2	3	4	5
L-Lab Control	1.0000	1.0000	1.0000	1.0000	0.9000
500	1.0000	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000	1.0000
2000	1.0000	1.0000	1.0000	1.0000	1.0000
4000	0.9000	1.0000	0.9000	1.0000	1.0000
8000	1.0000	1.0000	1.0000	0.9000	1.0000
10000	0.9000	0.8000	0.7000	0.7000	1.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Number Resp	Total Number
			Mean	Min	Max	CV%	N				
L-Lab Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5			1	50
500	1.0000	1.0204	1.4120	1.4120	1.4120	0.000	5	30.00	16.00	0	50
1000	1.0000	1.0204	1.4120	1.4120	1.4120	0.000	5	30.00	16.00	0	50
2000	1.0000	1.0204	1.4120	1.4120	1.4120	0.000	5	30.00	16.00	0	50
4000	0.9600	0.9796	1.3468	1.2490	1.4120	6.628	5	25.00	16.00	2	50
8000	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5	27.50	16.00	1	50
10000	0.8200	0.8367	1.1501	0.9912	1.4120	15.721	5	18.50	16.00	9	50

Auxiliary Tests

Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	Statistic 0.84723	Critical 0.91	Skew 0.37479	Kurt 3.37362
Equality of variance cannot be confirmed				

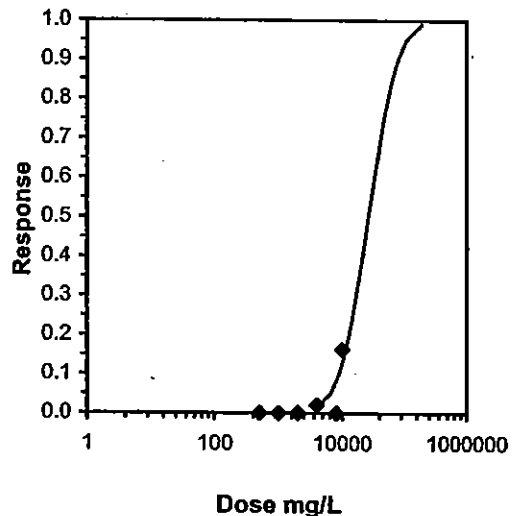
Hypothesis Test (1-tail, 0.05)

Steel's Many-One Rank Test	NOEC 10000	LOEC >10000	ChV	TU
----------------------------	------------	-------------	-----	----

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits	Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	2.70129	1.56977	-0.3755 5.77804	0.02	5.92899	9.48773	0.2	4.42537	0.37019	6
Intercept	-6.9542	6.16614	-19.04 5.13145							
TSCR	0.00608	0.0059	-0.0055 0.01764							

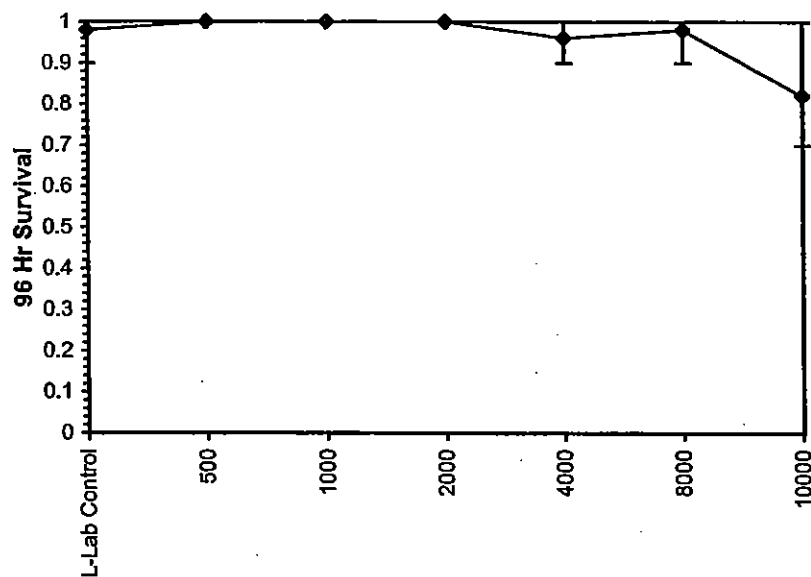
Point	Probits	mg/L	95% Fiducial Limits
EC01	2.674	3665.8	
EC05	3.355	6553.21	
EC10	3.718	8931.95	
EC15	3.964	11007.5	
EC20	4.158	12995.9	
EC25	4.326	14985.7	
EC40	4.747	21457.6	
EC50	5.000	26629.9	
EC60	5.253	33048.9	
EC75	5.674	47321.8	
EC80	5.842	54567.3	
EC85	6.036	64424.4	
EC90	6.282	79394.8	
EC95	6.645	108214	
EC99	7.326	193450	



Amphipod 96-Hr Survival Bioassay-96 Hr Survival

Start Date: 12/12/2002	Test ID: 0212-136	Sample ID: BEAZER
End Date: 12/16/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: ASTM 1999	Test Species: HA-Hyalella azteca
Comments: BMSA		

Dose-Response Plot



Appendix Table C-5c.
Water Quality Summary for 96-hour *Hyaella azteca*
Exposure to P-Phenol Sulfonic Acid (PSA)

Initiated: 12 December 2002

Concentration (mg/L)	Rep	No. Live Organisms		Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Percent Survival
		0	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
Lab Control	A	10	10	8.8	6.0	5.8	6.5	6.6	7.74	7.58	7.53	7.79	7.65	823	811	810	809	811	20.2	20.3	20.1	20.0	20.0	100
	B	10	10																					100
	C	10	10																					100
	D	10	10																					100
	E	10	9																					90
500	A	10	10	8.5	5.0	6.7	6.2	6.6	7.54	7.60	7.66	7.77	7.76	957	1089	950	952	954	20.2	20.2	20.1	20.1	20.1	100
	B	10	10																					100
	C	10	8																					80
	D	10	10																					100
	E	10	10																					100
1,000	A	10	10	8.5	5.4	6.8	6.2	7.0	7.43	7.65	7.71	7.80	7.84	1088	1351	1093	1098	1104	20.2	20.2	20.1	20.0	20.0	100
	B	10	10																					100
	C	10	9																					90
	D	10	10																					100
	E	10	10																					100
2,000	A	10	10	8.5	5.9	5.8	6.2	7.1	7.30	7.51	7.60	7.75	7.80	1355	1842	1349	1359	1368	20.2	20.3	20.0	19.9	20.0	100
	B	10	10																					100
	C	10	10																					100
	D	10	10																					100
	E	10	9																					90
4,000	A	10	10	8.8	6.0	5.5	6.2	7.3	7.15	7.32	7.51	7.66	7.69	1858	1800	1845	1845	1849	20.3	20.3	20.1	20.0	20.0	100
	B	10	10																					100
	C	10	9																					90
	D	10	10																					100
	E	10	10																					100
8,000	A	10	10	8.9	4.6	5.1	6.3	6.6	6.99	7.26	7.33	7.46	7.49	2830	2820	2810	2810	2810	20.3	20.3	20.1	20.0	20.0	100
	B	10	10																					100
	C	10	10																					100
	D	10	8																					80
	E	10	9																					90
10,000	A	10	7	8.7	4.4	4.4	5.0	6.0	6.91	7.20	7.24	7.40	7.40	3330	3310	3320	3320	3330	20.3	20.3	20.1	20.0	20.1	70
	B	10	0																					0
	C	10	10																					100
	D	10	5																					50
	E	10	10																					100

Amphipod 96-Hr Survival Bioassay-96 Hr Survival

Start Date: 12/12/2002	Test ID: 0212-134	Sample ID: BEAZER
End Date: 12/16/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: ASTM 1999	Test Species: HA-Hyalella azteca
Comments: PSA		

Conc-mg/L	1	2	3	4	5
L-Lab Control	1.0000	1.0000	1.0000	1.0000	0.9000
500	1.0000	1.0000	0.8000	1.0000	1.0000
1000	1.0000	1.0000	0.9000	1.0000	1.0000
2000	1.0000	1.0000	1.0000	1.0000	0.9000
4000	1.0000	1.0000	0.9000	1.0000	1.0000
8000	1.0000	1.0000	1.0000	0.8000	0.9000
10000	0.7000	0.0000	1.0000	0.5000	1.0000

Conc-mg/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N				
L-Lab Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5			1	50
500	0.9600	0.9796	1.3510	1.1071	1.4120	10.092	5	27.00	16.00	2	50
1000	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5	27.50	16.00	1	50
2000	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5	27.50	16.00	1	50
4000	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5	27.50	16.00	1	50
8000	0.9400	0.9592	1.3184	1.1071	1.4120	10.436	5	24.50	16.00	3	50
10000	0.6400	0.6531	0.9519	0.1588	1.4120	54.632	5	21.00	16.00	18	50

Auxiliary Tests

	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test Indicates non-normal distribution ($p \leq 0.01$)	0.73799	0.91	-1.3824	8.25233
Bartlett's Test indicates unequal variances ($p = 1.51E-05$)	32.1831	16.8119		

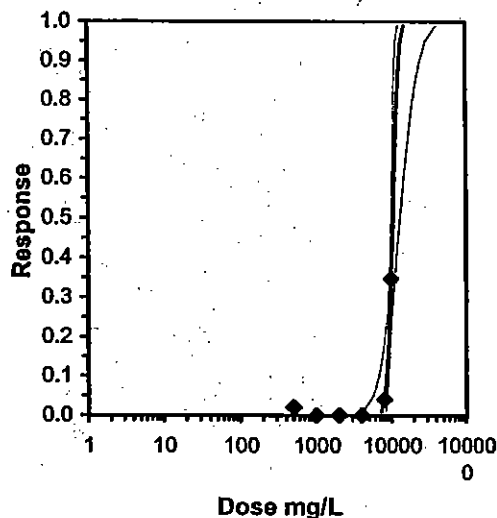
Hypothesis Test (1-tail, 0.05)

	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	10000	>10000		

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits	Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	14.3141	4.92484	4.66138 23.9667	0.02	0.64891	9.48773	0.96	4.028	0.06986	7
Intercept	-52.657	19.6219	-91.116 -14.198							
TSCR	0.024	0.00968	0.00503 0.04297							

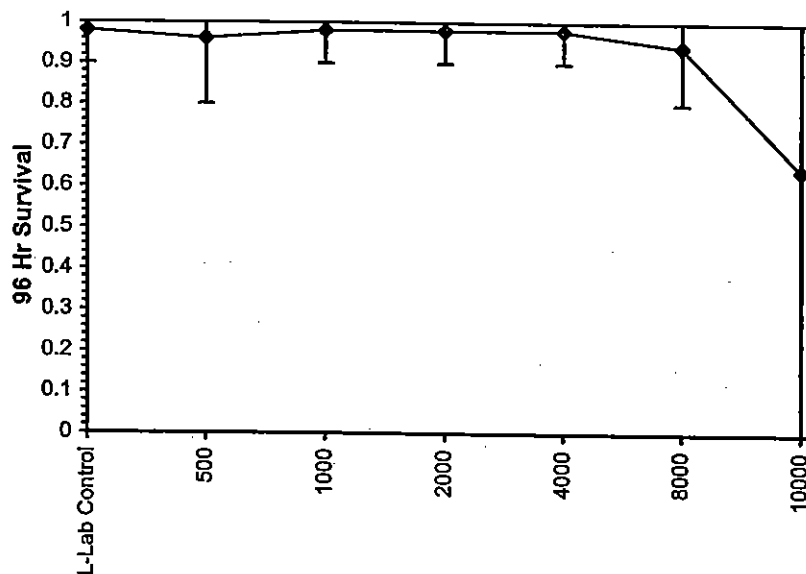
Point	Probits	mg/L	95% Fiducial Limits
EC01	2.674	7336.39	4104.53 8267.8
EC05	3.355	8186.4	5718.1 8872.31
EC10	3.718	8679.08	6798.75 9246.07
EC15	3.964	9028.13	7607.05 9549.54
EC20	4.158	9315.53	8263.55 9861.73
EC25	4.326	9569.38	8786.92 10235.5
EC40	4.747	10240.1	9687.46 11903
EC50	5.000	10666.1	10036.9 13341
EC60	5.253	11109.7	10342.9 15033.7
EC75	5.674	11888.5	10823.1 18419.5
EC80	5.842	12212.4	11011.6 19980.5
EC85	6.036	12601.2	11232.1 21974.4
EC90	6.282	13108	11512.2 24776.1
EC95	6.645	13896.8	11935.2 29611.4
EC99	7.326	15507	12761.1 41403.2



Amphipod 96-Hr Survival Bioassay-96 Hr Survival

Start Date: 12/12/2002	Test ID: 0212-134	Sample ID: BEAZER
End Date: 12/16/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: ASTM 1999	Test Species: HA-Hyaella azteca
Comments: PSA		

Dose-Response Plot



Amphipod 96-Hr Survival Bioassay-96 Hr Survival

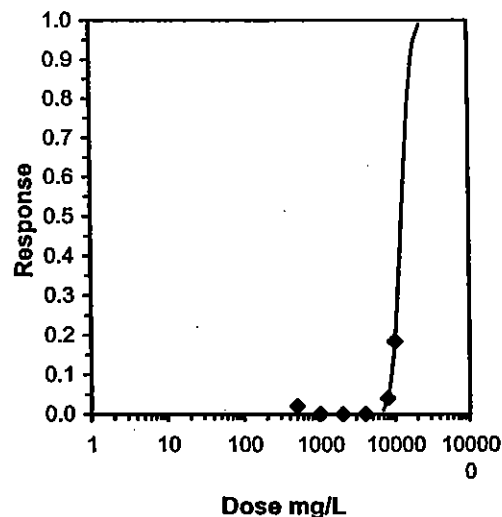
Start Date: 12/12/2002 Test ID: 0212-134b Sample ID: BEAZER
End Date: 12/16/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: INDUSTRIAL
Sample Date: Protocol: ASTM 1999 Test Species: HA-Hyaella azteca
Comments: PSA - w/o possible outlier in high conc

Conc-mg/L	1	2	3	4	5
L-Lab Control	1.0000	1.0000	1.0000	1.0000	0.9000
500	1.0000	1.0000	0.8000	1.0000	1.0000
1000	1.0000	1.0000	0.9000	1.0000	1.0000
2000	1.0000	1.0000	1.0000	1.0000	0.9000
4000	1.0000	1.0000	0.9000	1.0000	1.0000
8000	1.0000	1.0000	1.0000	0.8000	0.9000
10000	0.7000	1.0000	0.5000	1.0000	

Conc-mg/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N				
L-Lab Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5			1	50
500	0.9600	0.9796	1.3510	1.1071	1.4120	10.092	5	27.00	16.00	2	50
1000	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5	27.50	16.00	1	50
2000	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5	27.50	16.00	1	50
4000	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5	27.50	16.00	1	50
8000	0.9400	0.9592	1.3184	1.1071	1.4120	10.436	5	24.50	16.00	3	50
10000	0.8000	0.8163	1.1501	0.7854	1.4120	27.286	4	16.00	10.00	8	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$)	0.85416	0.908	-0.7242	1.59501
Bartlett's Test indicates equal variances ($p = 0.02$)	14.9711	16.8119		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Wilcoxon Rank Sum Test	10000	>10000		

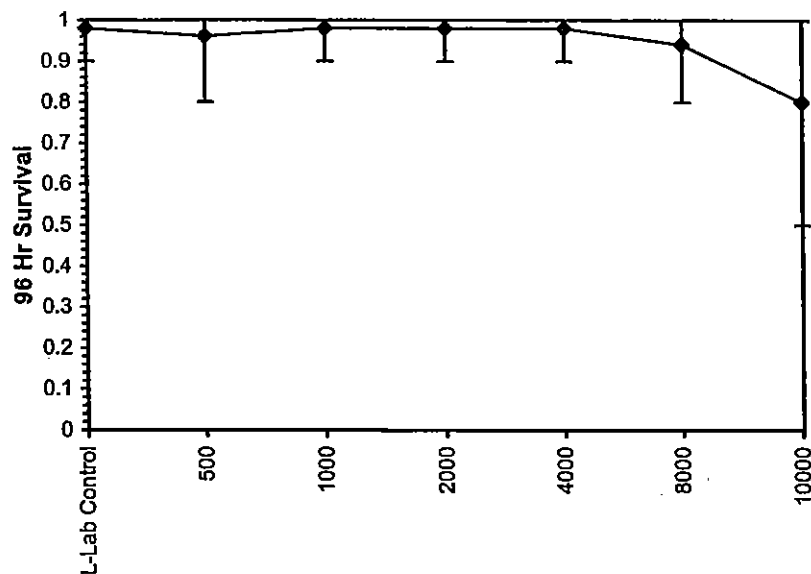
Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	9.01909	5.16552	-1.1053	19.1435	0.02	0.64896	9.48773	0.96	4.10135	0.11088	7
Intercept	-31.99	20.5378	-72.245	8.26372							
TSCR	0.024	0.00968	0.00503	0.04297							
Point	Probits	mg/L	95% Fiducial Limits								
EC01	2.674	6972.92									
EC05	3.355	8298.05									
EC10	3.718	9104.53									
EC15	3.964	9692.49									
EC20	4.158	10186.7									
EC25	4.326	10630.8									
EC40	4.747	11837.5									
EC50	5.000	12628.5									
EC60	5.253	13472.3									
EC75	5.674	15001.5									
EC80	5.842	15655.5									
EC85	6.036	16453.8									
EC90	6.282	17516.4									
EC95	6.645	19218.8									
EC99	7.326	22871.1									



Amphipod 96-Hr Survival Bioassay-96 Hr Survival

Start Date: 12/12/2002 Test ID: 0212-134b Sample ID: BEAZER
End Date: 12/16/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: INDUSTRIAL
Sample Date: Protocol: ASTM 1999 Test Species: HA-Hyaella azteca
Comments: PSA - w/o possible outlier in high conc

Dose-Response Plot



Chironomus tentans

Acute Exposure

Appendix Table C-6a.

**Water Quality Summary for 96-hour *Chironomus tentans*
Exposure to Benzene Metadisulfonic Acid (BMDSA)**

Initiated: 12 December 2002

Concentration (mg/L)	Rep	No. Live Organisms		Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Percent Survival
Control	A	10	9	8.4	7.5	4.0	8.4	4.5	7.74	7.54	7.48	7.99	7.37	823	845	841	842	854	20.2	20.3	20.5	19.9	20.1	90
	B	10	8																					80
	C	10	9																					90
	D	10	6																					60
	E	10	8																					80
500	A	10	6	8.0	8.2	3.8	8.4	4.1	7.82	7.83	7.60	8.29	7.52	1095	1081	1083	1085	1099	20.4	20.1	20.2	19.8	20.1	60
	B	10	8																					80
	C	10	8																					80
	D	10	8																					80
	E	10	9																					90
1,000	A	10	9	8.3	8.0	3.0	8.2	3.9	7.87	7.88	7.59	8.36	7.63	1352	1328	1313	1323	1338	20.3	20.1	20.2	19.8	20.1	90
	B	10	8																					80
	C	10	9																					90
	D	10	8																					80
	E	10	9																					90
2,000	A	10	8	8.5	8.2	3.2	8.2	4.2	7.57	7.93	7.57	8.31	7.70	1828	1827	1828	1827	1849	20.0	20.0	20.2	19.8	20.0	80
	B	10	10																					100
	C	10	9																					90
	D	10	10																					100
	E	10	10																					100
4,000	A	10	10	8.5	3.6	3.6	8.2	3.2	7.98	7.60	7.71	8.41	7.66	2860	2770	2760	2750	2780	20.1	20.0	20.2	19.8	20.0	100
	B	10	10																					100
	C	10	8																					80
	D	10	8																					80
	E	10	9																					90
8,000	A	10	9	8.6	3.4	3.5	8.3	4.7	7.99	7.60	7.70	8.45	7.71	4800	4560	4550	4540	4560	19.8	20.0	20.2	19.7	20.0	90
	B	10	9																					90
	C	10	7																					70
	D	10	8																					80
	E	10	10																					100
10,000	A	10	7	8.6	3.2	3.0	8.1	4.1	7.97	7.58	7.62	8.41	7.70	5730	5420	5040	5410	5440	20.2	19.9	20.0	19.8	19.9	70
	B	10	9																					90
	C	10	8																					80
	D	10	9																					90
	E	10	9																					90

Chironomus tentans-96 Hr Survival

Start Date: 12/12/2002 Test ID: 0212-138 Sample ID: BEAZER
 End Date: 12/16/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: ASTM 1999 Test Species: CT-Chironomus tentans
 Comments: BMDSA

Conc-mg/L	1	2	3	4	5
L-Lab Control	0.9000	0.8000	0.9000	0.6000	0.8000
500	0.6000	0.8000	0.8000	0.8000	0.9000
1000	0.9000	0.8000	0.9000	0.8000	0.9000
2000	0.8000	1.0000	0.9000	1.0000	1.0000
4000	1.0000	1.0000	0.8000	0.8000	0.9000
8000	0.9000	0.9000	0.7000	0.8000	1.0000
10000	0.7000	0.9000	0.8000	0.9000	0.9000

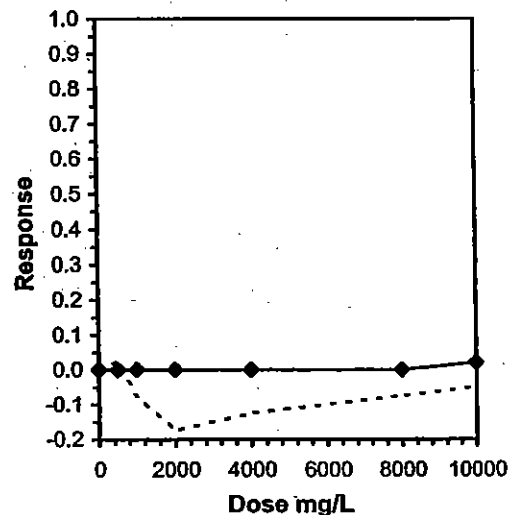
Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed		Isotonic	
			Mean	Min	Max	CV%	N		Critical	MSD	Mean	N-Mean
L-Lab Control	0.8000	1.0000	1.1197	0.8861	1.2490	13.274	5				0.8567	1.0000
500	0.7800	0.9750	1.0913	0.8861	1.2490	11.926	5	0.334	2.409	0.2047	0.8567	1.0000
1000	0.8600	1.0750	1.1923	1.1071	1.2490	6.519	5	-0.854	2.409	0.2047	0.8567	1.0000
2000	0.9400	1.1750	1.3184	1.1071	1.4120	10.436	5	-2.338	2.409	0.2047	0.8567	1.0000
4000	0.9000	1.1250	1.2575	1.1071	1.4120	12.128	5	-1.621	2.409	0.2047	0.8567	1.0000
8000	0.8600	1.0750	1.2017	0.9912	1.4120	13.288	5	-0.965	2.409	0.2047	0.8567	1.0000
10000	0.8400	1.0500	1.1691	0.9912	1.2490	10.000	5	-0.581	2.409	0.2047	0.8400	0.9805

Auxiliary Tests

Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.93954	0.91	-0.4392	-0.8049		
Bartlett's Test indicates equal variances (p = 0.90)					2.16123	16.8119				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10000	>10000			0.18181	0.22447	0.03021	0.01806	0.16469	6, 28

Linear Interpolation (200 Resamples)

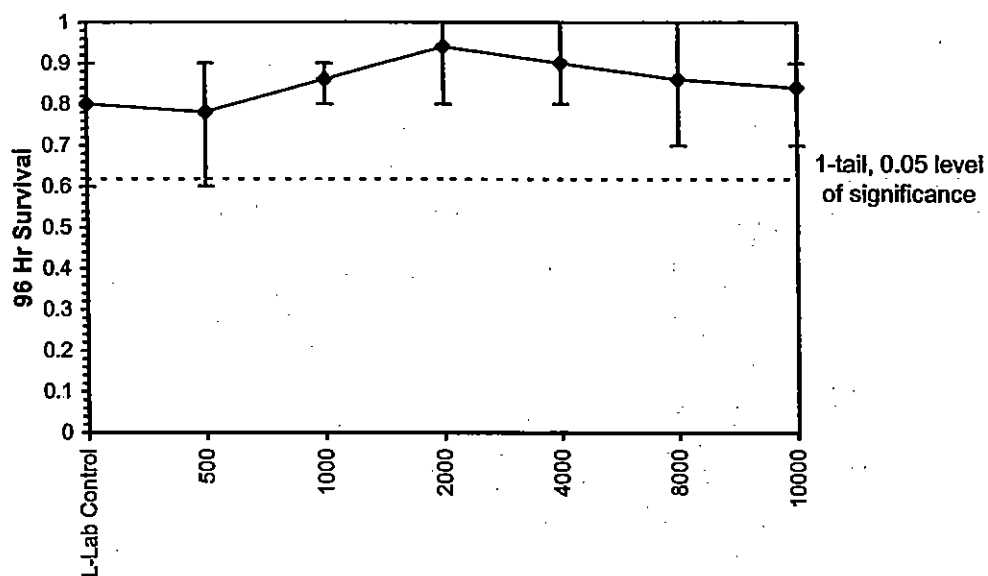
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Chironomus tentans-96 Hr Survival

Start Date: 12/12/2002	Test ID: 0212-138	Sample ID: BEAZER
End Date: 12/16/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: ASTM 1999	Test Species: CT-Chironomus tentans
Comments: BMDSA		

Dose-Response Plot



Appendix Table C-6b.
Water Quality Summary for 96-hour *Chironomus tentans*
Exposure to Benzene Monosulfonic Acid (BMSA)

Initiated: 12 December 2002

Concentration (mg/L)	Rep	No. Live Organisms		Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Percent Survival
		0	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
Control	A	10	8	8.8	7.5	2.5	8.1	4.4	7.80	7.84	7.39	7.53	7.48	819	845	843	844	864	20.3	20.3	20.0	19.6	20.0	80
	B	10	7																					70
	C	10	8																					80
	D	10	9																					90
	E	10	8																					80
500	A	10	9	8.0	8.7	3.0	8.0	4.8	7.52	7.98	7.41	8.06	7.60	1011	1010	1006	1007	1030	20.6	19.8	20.2	19.4	19.9	90
	B	10	9																					90
	C	10	7																					70
	D	10	8																					80
	E	10	9																					90
1,000	A	10	8	8.1	8.7	3.0	8.1	5.5	7.57	8.00	7.44	8.19	7.70	1182	1174	1175	1170	1170	20.6	19.8	20.2	19.4	19.9	80
	B	10	10																					100
	C	10	10																					100
	D	10	8																					80
	E	10	7																					70
2,000	A	10	7	8.0	8.0	3.0	8.0	5.1	7.83	7.94	7.44	8.27	7.72	1529	1503	1510	1494	1528	20.5	19.8	20.3	19.3	19.9	70
	B	10	10																					100
	C	10	5																					50
	D	10	10																					100
	E	10	9																					90
4,000	A	10	10	8.2	8.6	2.5	8.3	5.0	7.87	8.03	7.50	8.23	7.72	2230	2170	2190	2160	2200	20.5	19.8	20.3	19.4	20.0	100
	B	10	10																					100
	C	10	8																					80
	D	10	8																					80
	E	10	9																					90
8,000	A	10	9	8.2	8.8	2.9	8.6	5.0	7.89	8.10	7.51	8.27	7.74	3540	3420	3430	3390	3450	20.3	19.7	20.4	19.4	19.9	90
	B	10	9																					90
	C	10	10																					100
	D	10	10																					100
	E	10	7																					70
10,000	A	10	8	8.7	8.6	4.0	8.5	5.8	7.92	8.09	7.53	8.24	7.78	4240	4080	4120	4060	4160	20.3	19.8	20.5	19.3	19.9	80
	B	10	8																					80
	C	10	9																					90
	D	10	7																					70
	E	10	10																					100

Chironomus tentans-96 Hr Survival

Start Date: 12/12/2002 Test ID: 0212-139 Sample ID: BEAZER
 End Date: 12/16/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: ASTM 1999 Test Species: CT-Chironomus tentans
 Comments: BMSA

Conc-mg/L	1	2	3	4	5
L-Lab Control	0.8000	0.7000	0.8000	0.9000	0.8000
500	0.9000	0.9000	0.7000	0.8000	0.9000
1000	0.8000	1.0000	1.0000	0.8000	0.7000
2000	0.7000	1.0000	0.5000	1.0000	0.9000
4000	1.0000	1.0000	0.8000	0.8000	0.9000
8000	0.9000	0.9000	1.0000	1.0000	0.7000
10000	0.8000	0.8000	0.9000	0.7000	1.0000

Conc-mg/L	Transform: Arcsin Square Root							1-Tailed		Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean N-Mean
L-Lab Control	0.8000	1.0000	1.1123	0.9912	1.2490	8.222	5				0.8533 1.0000
500	0.8400	1.0500	1.1691	0.9912	1.2490	10.000	5	-0.513	2.409	0.2667	0.8533 1.0000
1000	0.8600	1.0750	1.2059	0.9912	1.4120	16.090	5	-0.845	2.409	0.2667	0.8533 1.0000
2000	0.8200	1.0250	1.1699	0.7854	1.4120	23.537	5	-0.520	2.409	0.2667	0.8533 1.0000
4000	0.9000	1.1250	1.2575	1.1071	1.4120	12.128	5	-1.311	2.409	0.2667	0.8533 1.0000
8000	0.9000	1.1250	1.2627	0.9912	1.4120	13.643	5	-1.358	2.409	0.2667	0.8533 1.0000
10000	0.8400	1.0500	1.1733	0.9912	1.4120	13.786	5	-0.551	2.409	0.2667	0.8400 0.9844

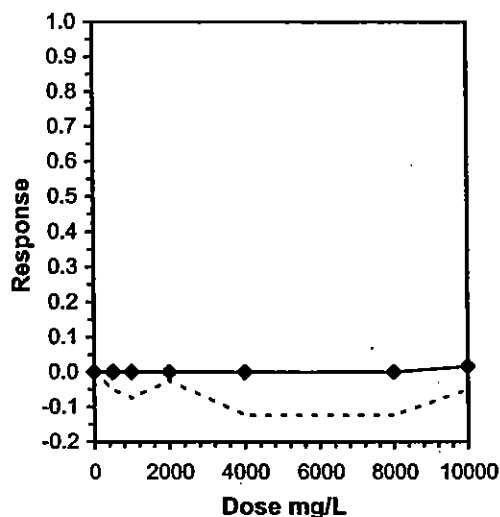
Auxiliary Tests

Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$) 0.96172 0.91 -0.2871 -0.5073
 Bartlett's Test indicates equal variances ($p = 0.50$) 5.3433 16.8119

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	10000	>10000			0.24406	0.30351	0.01431	0.03066	0.82685	6, 28

Linear Interpolation (200 Resamples)

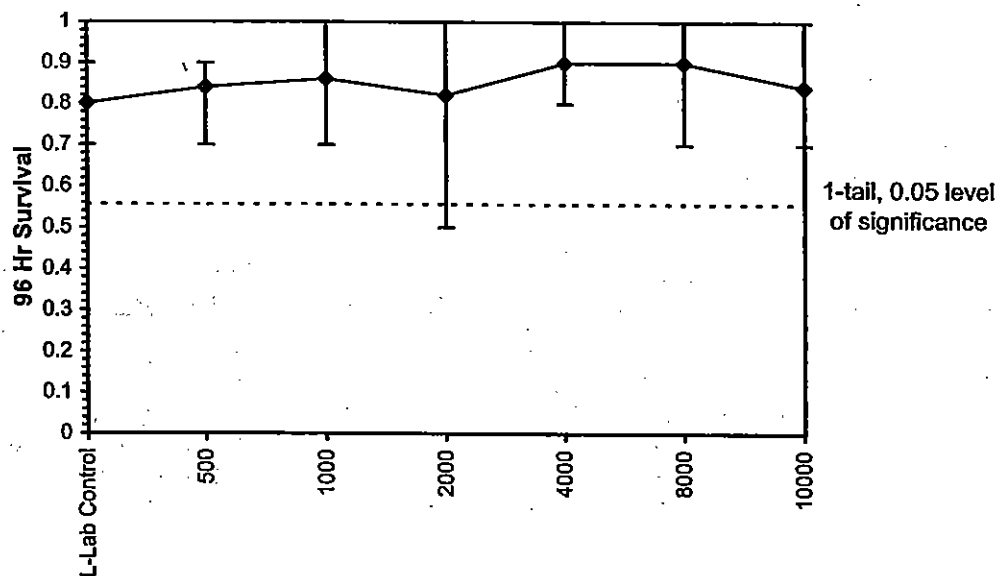
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Chironomus tentans-96 Hr Survival

Start Date: 12/12/2002	Test ID: 0212-139	Sample ID: BEAZER
End Date: 12/16/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: ASTM 1999	Test Species: CT-Chironomus tentans
Comments: BMSA		

Dose-Response Plot



Appendix Table C-6c.

Water Quality Summary for 96-hour *Chironomus tentans*
Exposure to P-Phenol Sulfonic Acid (PSA)

Initiated: 12 December 2002

Concentration (mg/L)	Rep	No. Live Organisms		Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (umhos-cm)					Temperature (°C)					Percent Survival
		0	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
Control	A	10	8	8.8	7.5	2.5	8.1	4.4	7.80	7.84	7.39	7.53	7.46	819	845	843	844	864	20.3	20.3	20.0	19.6	20.0	80
	B	10	7																					70
	C	10	8																					80
	D	10	9																					90
	E	10	8																					80
500	A	10	10	8.5	4.5	3.4	8.1	5.8	7.54	7.57	7.51	7.81	7.76	957	964	964	957	983	20.2	20.0	20.5	19.3	20.0	100
	B	10	10																					100
	C	10	9																					90
	D	10	10																					100
	E	10	8																					80
1,000	A	10	9	8.5	4.8	3.5	8.6	5.5	7.43	7.65	7.59	7.93	7.82	1351	1113	1109	1103	1130	20.2	19.9	20.5	19.2	20.0	90
	B	10	9																					90
	C	10	8																					80
	D	10	9																					90
	E	10	8																					80
2,000	A	10	5	8.5	4.0	5.0	8.6	5.2	7.30	7.60	7.66	7.92	7.87	1355	1340	1347	1341	1377	20.2	20.2	19.9	19.3	20.0	50
	B	10	6																					60
	C	10	8																					80
	D	10	7																					70
	E	10	10																					100
4,000	A	10	8	8.8	3.6	4.7	8.5	5.0	7.15	7.47	7.64	7.81	7.77	1858	1815	1828	1825	1864	20.3	20.1	19.8	19.3	20.0	80
	B	10	7																					70
	C	10	8																					80
	D	10	6																					60
	E	10	7																					70
8,000	A	10	9	8.9	4.0	5.0	8.0	5.6	6.99	7.46	7.56	7.69	7.69	2830	2730	2750	2750	2820	20.3	20.1	19.8	19.4	20.0	90
	B	10	9																					90
	C	10	8																					80
	D	10	7																					70
	E	10	8																					80
10,000	A	10	9	8.7	2.2	3.5	7.0	4.4	6.91	7.35	7.48	7.63	7.62	3330	3200	3220	3230	3300	20.3	19.9	19.6	19.4	19.9	90
	B	10	8																					80
	C	10	7																					70
	D	10	9																					90
	E	10	8																					80

Chironomus tentans-96 Hr Survival

Start Date: 12/12/2002 Test ID: 0212-137 Sample ID: BEAZER
 End Date: 12/16/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: ASTM 1999 Test Species: CT-Chironomus tentans
 Comments: PSA

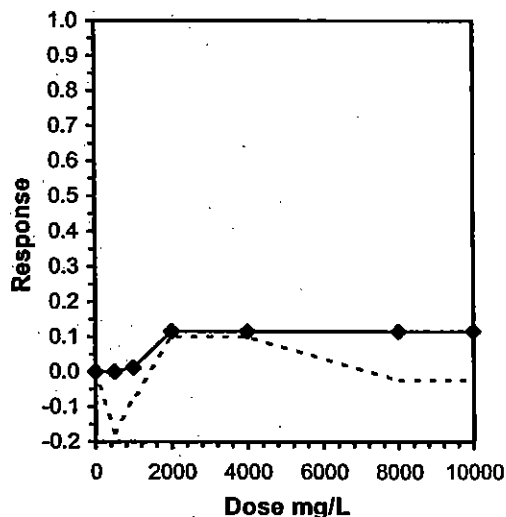
Conc-mg/L	1	2	3	4	5
L-Lab Control	0.8000	0.7000	0.8000	0.9000	0.8000
500	1.0000	1.0000	0.9000	1.0000	0.8000
1000	0.9000	0.9000	0.8000	0.9000	0.8000
2000	0.5000	0.6000	0.8000	0.7000	1.0000
4000	0.8000	0.7000	0.8000	0.6000	0.7000
8000	0.9000	0.9000	0.8000	0.7000	0.8000
10000	0.9000	0.8000	0.7000	0.9000	0.8000

Conc-mg/L	Transform: Arcsin Square Root							1-Tailed		Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean N-Mean
L-Lab Control	0.8000	1.0000	1.1123	0.9912	1.2490	8.222	5				0.8700 1.0000
500	0.9400	1.1750	1.3184	1.1071	1.4120	10.436	5	-2.444	2.409	0.2032	0.8700 1.0000
1000	0.8600	1.0750	1.1923	1.1071	1.2490	6.519	5	-0.948	2.409	0.2032	0.8600 0.9885
2000	0.7200	0.9000	1.0364	0.7854	1.4120	23.325	5	0.901	2.409	0.2032	0.7700 0.8851
4000	0.7200	0.9000	1.0165	0.8861	1.1071	9.166	5	1.136	2.409	0.2032	0.7700 0.8851
8000	0.8200	1.0250	1.1407	0.9912	1.2490	9.612	5	-0.336	2.409	0.2032	0.7700 0.8851
10000	0.8200	1.0250	1.1407	0.9912	1.2490	9.612	5	-0.336	2.409	0.2032	0.7700 0.8851

Auxillary Tests						Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)						0.94845	0.91	0.42821	1.51698						
Bartlett's Test indicates equal variances (p = 0.27)						7.6062	16.8119								
Hypothesis Test (1-tail, 0.05)						NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test						10000	>10000			0.18161	0.22585	0.05105	0.01779	0.02625	6, 28

Linear Interpolation (200 Resamples)

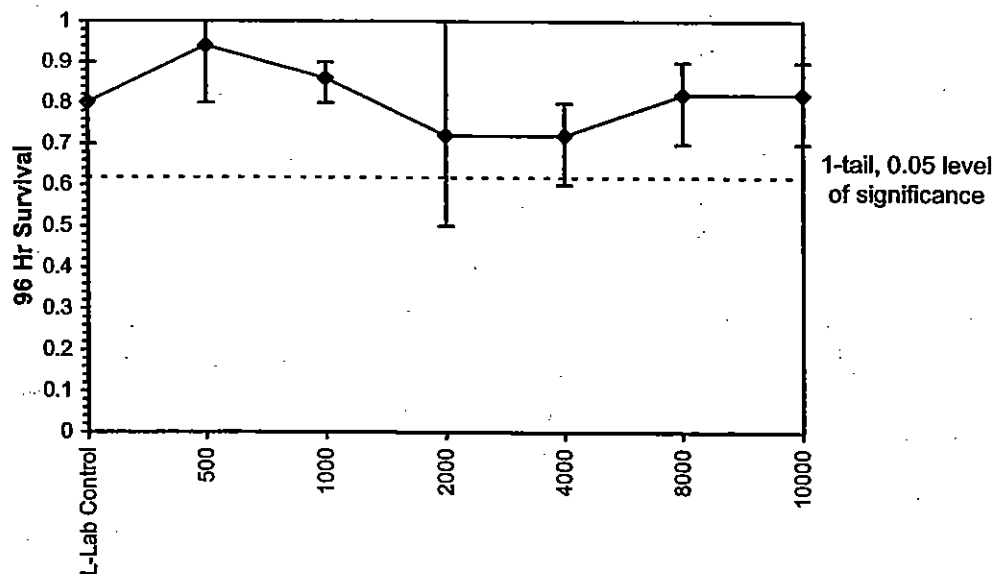
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	1372.22			
IC10	1855.56			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Chironomus tentans-96 Hr Survival

Start Date: 12/12/2002	Test ID: 0212-137	Sample ID: BEAZER
End Date: 12/16/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: ASTM 1999	Test Species: CT-Chironomus tentans
Comments: PSA		

Dose-Response Plot



Appendix Table C-6d.
Water Quality Summary for 96-hour *Chironomus tentans*
Exposure to Resorcinol (RES)

Initiated: 12 December 2002

Concentration (mg/L)	Rep	No. Live Organisms		Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)					Temperature (°C)					Percent Survival
Control	A	10	9	8.4	7.5	4.0	8.4	4.5	7.74	7.54	7.48	7.99	7.37	823	845	841	842	854	20.2	20.3	20.5	19.9	20.1	90
	B	10	8																					80
	C	10	9																					90
	D	10	6																					60
	E	10	8																					80
100	A	10	7	9.5	5.4	4.2	7.8	2.4	8.07	7.42	7.53	7.34	7.25	818	822	817	824	823	20.4	19.9	19.9	19.8	19.9	70
	B	10	6																					60
	C	10	10																					100
	D	10	4																					40
	E	10	6																					60
250	A	10	1	9.2	4.7	3.5	8.0	1.1	7.95	7.53	7.54	7.41	7.34	803	815	806	818	823	20.5	19.9	20.0	19.9	20.0	10
	B	10	0																					0
	C	10	1																					10
	D	10	1																					10
	E	10	1																					10
500	A	10	0	9.1	4.0	5.1	7.4	0.7	7.84	7.53	7.59	7.56	7.36	785	783	792	797	798	20.5	20.0	20.0	20.0	20.0	0
	B	10	0																					0
	C	10	0																					0
	D	10	0																					0
	E	10	0																					0
750	A	10	0	8.7	3.9	4.9	8.1	0.9	7.69	7.58	7.62	7.74	7.46	762	763	782	787	791	20.3	19.8	20.0	20.0	20.0	0
	B	10	0																					0
	C	10	0																					0
	D	10	0																					0
	E	10	0																					0
1,000	A	10	0	9.1	6.0	4.9	8.3	5.5	7.63	7.76	7.65	7.82	7.97	742	743	766	772	775	20.5	19.8	20.0	20.1	20.1	0
	B	10	0																					0
	C	10	0																					0
	D	10	0																					0
	E	10	0																					0
2,000	A	10	0	9.0	7.8	6.6	8.3	6.1	7.47	7.79	7.67	7.79	7.93	666	675	696	700	703	20.5	19.6	20.1	20.1	20.1	0
	B	10	0																					0
	C	10	0																					0
	D	10	0																					0
	E	10	0																					0

Chironomus tentans-96 Hr Survival

Start Date: 12/12/2002 Test ID: 0212-140 Sample ID: BEAZER
 End Date: 12/16/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: ASTM 1999 Test Species: CT-Chironomus tentans
 Comments: RES

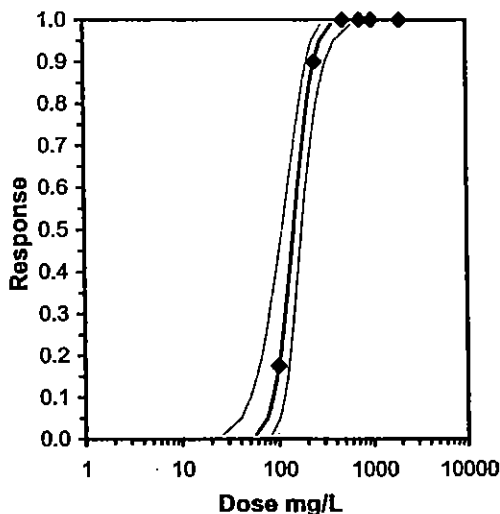
Conc-mg/L	1	2	3	4	5
L-Lab Control	0.9000	0.8000	0.9000	0.6000	0.8000
100	0.7000	0.6000	1.0000	0.4000	0.6000
250	0.1000	0.0000	0.1000	0.1000	0.1000
500	0.0000	0.0000	0.0000	0.0000	0.0000
750	0.0000	0.0000	0.0000	0.0000	0.0000
1000	0.0000	0.0000	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-mg/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N				
L-Lab Control	0.8000	1.0000	1.1197	0.8861	1.2490	13.274	5			10	50
100	0.6600	0.8250	0.9720	0.6847	1.4120	27.762	5	22.00	16.00	17	50
*250	0.0800	0.1000	0.2892	0.1588	0.3218	25.205	5	15.00	16.00	46	50
*500	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	5	15.00	16.00	50	50
*750	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	5	15.00	16.00	50	50
*1000	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	5	15.00	16.00	50	50
*2000	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	5	15.00	16.00	50	50

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.69574	0.91	1.21124	8.89274
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	250	158.114	

Maximum Likelihood-Probit

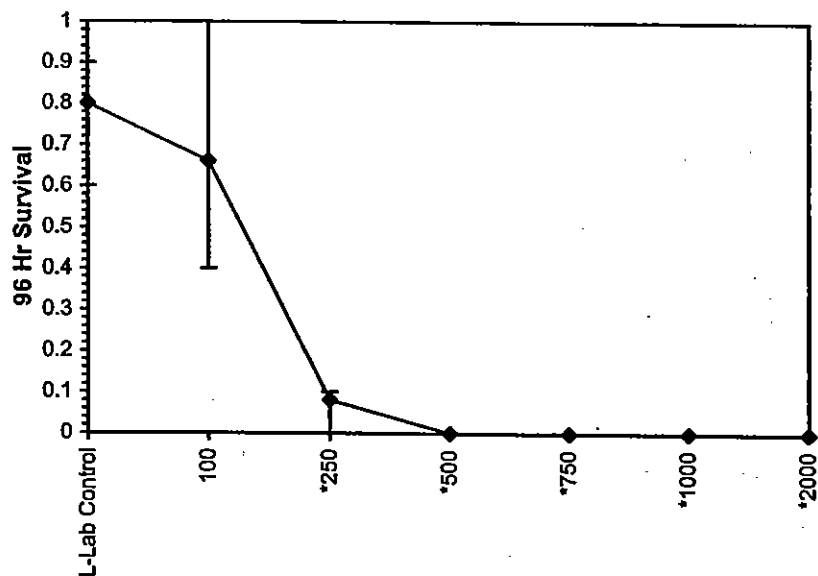
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	5.67573	1.10484	3.51024	7.84121	0.2	0.0626	9.48773	1	2.16818	0.17619	3
Intercept	-7.306	2.49343	-12.193	-2.4188							
TSCR	0.2013	0.05646	0.09063	0.31196							
Point	Probits	mg/L	95% Fiducial Limits								
EC01	2.674	57.3191	26.0136	83.2878							
EC05	3.355	75.5738	40.2859	102.727							
EC10	3.718	87.5752	50.7482	115.146							
EC15	3.964	96.7316	59.2189	124.537							
EC20	4.158	104.687	66.8747	132.691							
EC25	4.326	112.031	74.1525	140.25							
EC40	4.747	132.904	95.6412	162.207							
EC50	5.000	147.291	110.812	178.078							
EC60	5.253	163.235	127.562	196.771							
EC75	5.674	193.648	158.094	236.838							
EC80	5.842	207.234	170.815	256.901							
EC85	6.036	224.277	185.915	284.002							
EC90	6.282	247.726	205.285	324.614							
EC95	6.645	287.066	234.976	400.434							
EC99	7.326	378.489	295.942	607.303							



Chironomus tentans-96 Hr Survival

Start Date: 12/12/2002	Test ID: 0212-140	Sample ID: BEAZER
End Date: 12/16/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: ASTM 1999	Test Species: CT-Chironomus tentans
Comments: RES		

Dose-Response Plot



Chironomus tentans

Chronic Exposure

Appendix Table C-7.
Water Quality Summary for 10-day *Chironomus tentans*
Exposure to Resorcinol (RES)

Initiated: 12 December 2002

Concentration: Control

Test Day	pH (pH units)	Conductivity (umhos/cm)	Dissolved O ₂ (mg/L)	Temperature (°C)
0	7.74	823	8.4	20.2
1	7.51	813	3.0	19.5
2	7.41	833	3.7	20.1
3	7.63	838	8.1	20.1
4	7.56	836	3.9	20.1
5	7.89	836	7.9	20.0
6	8.20	848	8.5	20.0
7	8.18	835	8.5	19.8
8	8.28	840	6.0	20.0
9	8.15	842	8.6	19.8
10	8.21	848	8.6	19.7

Appendix Table C-7 (con'd).
Water Quality Summary for 10-day *Chironomus tentans*
Exposure to Resorcinol (RES)

Initiated: 12 December 2002

Concentration: 100 mg/L

Test Day	pH (pH units)	Conductivity (umhos/cm)	Dissolved O ₂ (mg/L)	Temperature (°C)
0	8.07	818	9.5	20.4
1	7.46	815	3.9	19.7
2	7.37	835	3.3	20.0
3	7.52	838	7.6	20.1
4	7.45	844	1.5	20.1
5	7.79	843	7.1	20.0
6	8.11	850	8.3	20.0
7	8.16	842	8.4	19.8
8	8.37	853	6.0	19.9
9	8.06	864	8.1	19.7
10	8.18	877	8.5	19.6

Concentration: 250 mg/L

Test Day	pH (pH units)	Conductivity (umhos/cm)	Dissolved O ₂ (mg/L)	Temperature (°C)
0	7.95	803	9.2	20.5
1	7.47	802	3.1	19.7
2	7.43	822	3.7	20.1
3	7.43	825	7.5	20.1
4	7.40	831	1.0	20.1
5	7.65	829	6.2	19.9
6	8.03	833	8.0	20.0
7	8.15	819	8.4	19.8
8	8.35	825	6.0	19.8
9	8.15	837	8.5	19.8
10	8.31	848	8.7	19.7

Appendix Table C-7 (con'd).
Water Quality Summary for 10-day *Chironomus tentans*
Exposure to Resorcinol (RES)

Initiated: 12 December 2002

Concentration: 500 mg/L

Test Day	pH (pH units)	Conductivity (umhos/cm)	Dissolved O ₂ (mg/L)	Temperature (°C)
0	7.84	785	9.1	20.5
1	7.49	786	3.5	19.9
2	7.53	802	4.4	20.1
3	7.75	808	7.8	20.1
4	7.47	814	0.8	20.1
5	7.26	815	1.2	20.2
6	8.08	813	8.1	20.2
7	8.10	810	8.5	19.6
8	8.34	823	6.0	19.7
9	8.24	831	8.7	19.7
10	8.31	848	8.7	19.7

Concentration: 750 mg/L

Test Day	pH (pH units)	Conductivity (umhos/cm)	Dissolved O ₂ (mg/L)	Temperature (°C)
0	7.69	762	8.7	20.3
1	7.52	749	3.0	19.9
2	7.52	787	4.1	20.1
3	7.78	794	8.0	20.1
4	7.53	799	0.6	20.1
5	8.18	801	8.0	20.0
6	8.20	803	8.2	20.0
7	8.13	803	8.5	19.6
8	8.31	811	6.0	19.7
9	7.97	823	8.4	19.7
10	8.24	842	8.7	19.6

Appendix Table C-7 (con'd).
Water Quality Summary for 10-day *Chironomus tentans*
Exposure to Resorcinol (RES)

Initiated: 12 December 2002

Concentration: 1000 mg/L

Test Day	pH (pH units)	Conductivity (umhos/cm)	Dissolved O ₂ (mg/L)	Temperature (°C)
0	7.63	742	9.1	20.5
1	7.67	759	5.4	20.0
2	7.51	762	3.7	20.1
3	7.79	769	8.0	20.1
4	7.86	777	5.0	20.1
5	7.50	774	6.2	20.2
6	8.04	773	8.5	19.9
7	8.05	770	8.5	19.7
8	8.16	777	6.0	19.7
9	8.06	787	8.5	19.7
10	8.16	797	8.5	19.6

Concentration: 2000 mg/L

Test Day	pH (pH units)	Conductivity (umhos/cm)	Dissolved O ₂ (mg/L)	Temperature (°C)
0	7.47	666	9.0	20.5
1	7.74	612	7.8	20.1
2	7.58	687	6.7	20.1
3	7.75	694	8.0	20.1
4	7.81	700	4.8	20.3
5	7.62	700	3.9	20.2
6	8.11	703	8.3	20.0
7	8.12	699	8.6	19.8
8	8.24	708	6.2	19.8
9	8.06	720	8.8	19.8
10	8.09	727	8.7	19.7

Appendix Table C-8.
Growth data for 10-day *Chironomus tentans*
Exposure to Resorcinol (RES)

Initiated: 12 December 2002

Time Zero Weights

Replicate	No. <i>Chironomus</i>	Pan. Weight (mg)	Pan + Organism Weight (mg)	Final Dry Weight per Organism (mg)	Mean Dry Weight per Organism (mg)
T0 A	5	53.661	53.894	0.047	0.038
T0 B	5	52.460	52.657	0.039	
T0 C	5	54.117	54.232	0.023	
T0 D	5	53.746	53.992	0.049	
T0 E	5	52.722	52.876	0.031	

Final 10-day Weights

Conc. (mg/L) & Replicate	No. <i>Chironomus</i>	Pan. Weight (mg)	Pan + Organism Weight (mg)	Final Dry Weight per Organism (mg)	Mean Dry Weight per Organism (mg)	Mean Growth per Organism (mg)
LCA	9	53.964	55.518	0.173	0.216	0.178
LC B	8	51.908	53.843	0.242		
LC C	7	52.037	53.910	0.268		
LC D	8	52.737	54.146	0.176		
LC E	4	52.536	53.415	0.220		
100 A	3	54.314	54.662	0.116	0.200	0.162
100 B	6	53.275	54.603	0.221		
100 C	5	52.044	53.136	0.218		
100 D	6	53.963	55.365	0.234		
100 E	2	52.696	53.114	0.209		
250 A	0	NA	NA	NA	NA	NA
250 B	0	NA	NA	NA		
250 C	0	NA	NA	NA		
250 D	0	NA	NA	NA		
250 E	0	NA	NA	NA		
500 A	0	NA	NA	NA	NA	NA
500 B	0	NA	NA	NA		
500 C	0	NA	NA	NA		
500 D	0	NA	NA	NA		
500 E	0	NA	NA	NA		
750 A	0	NA	NA	NA	NA	NA
750 B	0	NA	NA	NA		
750 C	0	NA	NA	NA		
750 D	0	NA	NA	NA		
750 E	0	NA	NA	NA		
1000 A	0	NA	NA	NA	NA	NA
1000 B	0	NA	NA	NA		
1000 C	0	NA	NA	NA		
1000 D	0	NA	NA	NA		
1000 E	0	NA	NA	NA		
2000 A	0	NA	NA	NA	NA	NA
2000 B	0	NA	NA	NA		
2000 C	0	NA	NA	NA		
2000 D	0	NA	NA	NA		
2000 E	0	NA	NA	NA		

Chironomus tentans-% Survival

Start Date: 12/12/2002 Test ID: 0212-141 Sample ID: BEAZER
 End Date: 12/22/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: ASTM 1999 Test Species: CT-Chironomus tentans
 Comments: RES

Conc-mg/L	1	2	3	4	5
L-Lab Control	0.9000	0.8000	0.7000	0.8000	0.4000
100	0.3000	0.6000	0.5000	0.6000	0.2000
250	0.0000	0.0000	0.0000	0.0000	0.0000
500	0.0000	0.0000	0.0000	0.0000	0.0000
750	0.0000	0.0000	0.0000	0.0000	0.0000
1000	0.0000	0.0000	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-mg/L	Transform: Untransformed							Rank Sum	1-Tailed Critical	Mean	N-Mean
	Mean	N-Mean	Mean	Min	Max	CV%	N				
L-Lab Control	0.7200	1.0000	0.7200	0.4000	0.9000	26.716	5			0.7200	0.0000
100	0.4400	0.6111	0.4400	0.2000	0.6000	41.286	5	18.00	16.00	0.4400	0.3889
*250	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	5	15.00	16.00	0.0000	1.0000
*500	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	5	15.00	16.00	0.0000	1.0000
*750	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	5	15.00	16.00	0.0000	1.0000
*1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	5	15.00	16.00	0.0000	1.0000
*2000	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	5	15.00	16.00	0.0000	1.0000

Auxiliary Tests

Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$) Statistic 0.6831 Critical 0.91 Skew -1.4225 Kurt 5.32795

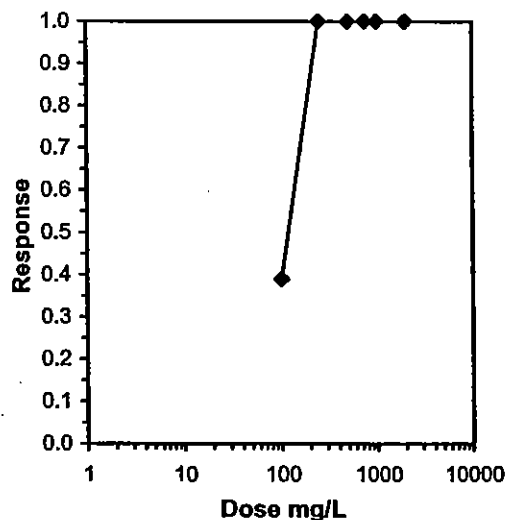
Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05) NOEC LOEC ChV TU

Steel's Many-One Rank Test 100 250 158.114

Trimmed Spearman-Kärber

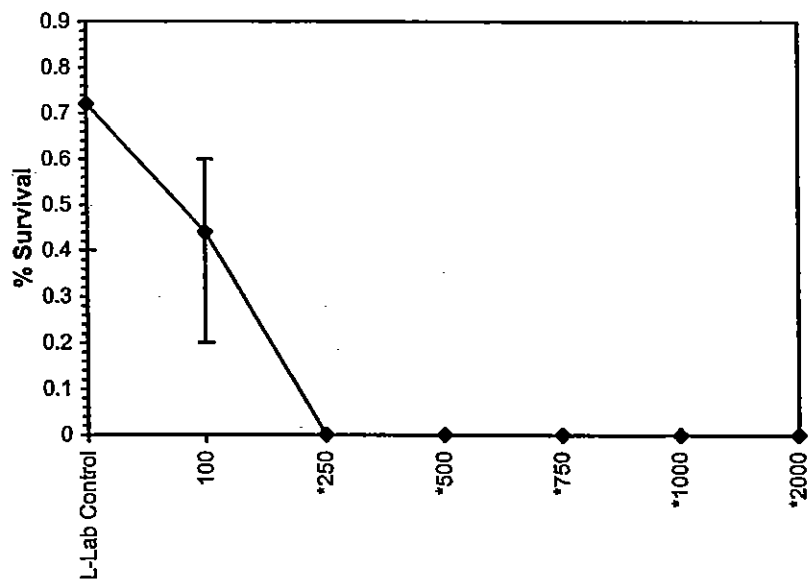
Trim Level	EC50	95% CL	
0.0%			
5.0%			
10.0%			
20.0%			
Auto-38.9%	118.13	69.19	201.68



Chironomus tentans-% Survival

Start Date: 12/12/2002	Test ID: 0212-141	Sample ID: BEAZER
End Date: 12/22/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: ASTM 1999	Test Species: CT-Chironomus tentans
Comments: RES		

Dose-Response Plot



Chironomus tentans-Weight

Start Date: 12/12/2002 Test ID: 0212-141 Sample ID: BEAZER
 End Date: 12/22/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: Industrial Product
 Sample Date: Protocol: ASTM 1999 Test Species: CT-Chironomus tentans
 Comments: RES

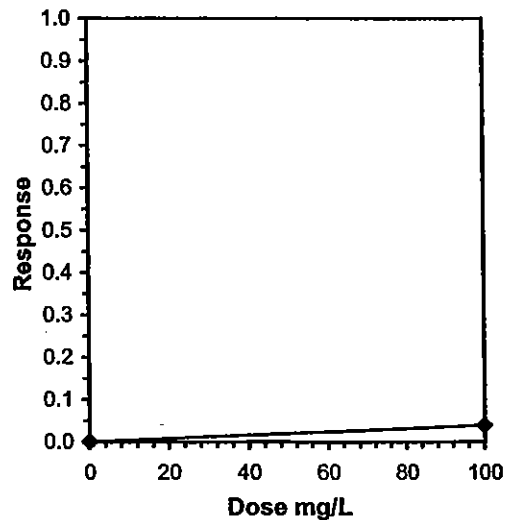
Conc-mg/L	1	2	3	4	5
L-Lab Control	0.0017	0.0024	0.0023	0.0018	0.0022
100	0.0012	0.0022	0.0022	0.0023	0.0021

Conc-mg/L	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
L-Lab Control	0.0021	1.0000	0.0021	0.0017	0.0024	15.195	5				0.0021	1.0000
100	0.0020	0.9605	0.0020	0.0012	0.0023	23.839	5	0.321	1.860	0.0005	0.0020	0.9605

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.81993	0.781	-1.3941	1.34808		
F-Test indicates equal variances (p = 0.45)	2.27103	23.1539				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	0.00048	0.22854	#####	#####	0.75637	1, 8

Linear Interpolation (200 Resamples)

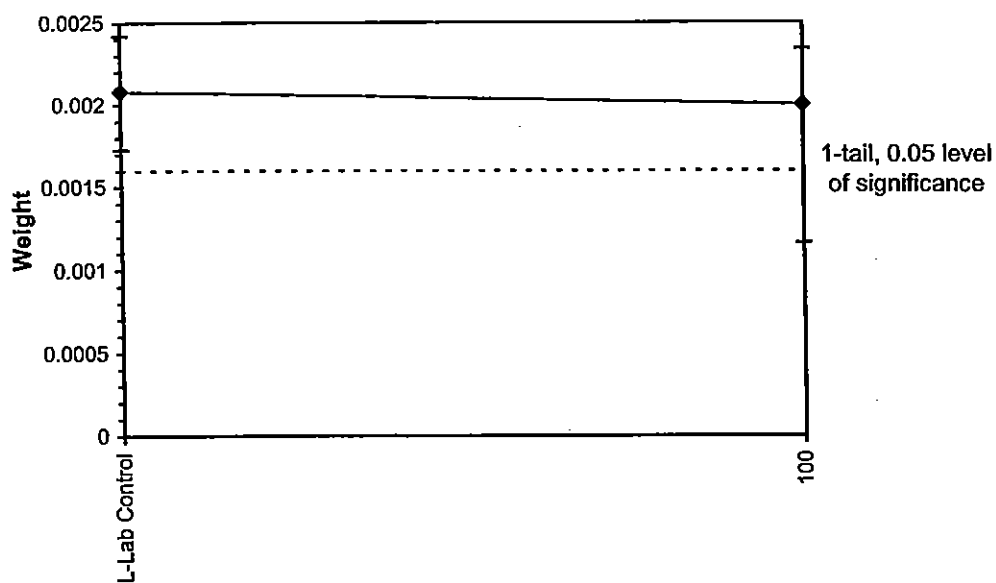
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Chironomus tentans-Weight

Start Date: 12/12/2002	Test ID: 0212-141	Sample ID: BEAZER
End Date: 12/22/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Industrial Product
Sample Date:	Protocol: ASTM 1999	Test Species: CT-Chironomus tentans
Comments: RES		

Dose-Response Plot



Culex pipiens

Appendix Table C-9a.
Water Quality Summary for 96-hour *Culex pipiens*
Exposure to Benzene Metadisulfonic Acid (BMDSA)

Initiated: 15 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)			Temperature (°C)					Percent Survival
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	48	96	0	24	48	72	96	
Lab Control	A	5	5	5	4	4	9.7	5.8	7.0	5.8	5.5	7.90	7.74	7.65	7.37	7.38	170	174	181	20.0	20.8	20.7	20.6	20.9	80
	B	5	5	5	5	5																			100
	C	5	5	4	4	4																			80
	D	5	5	5	5	5																			100
	E	5	5	5	5	5																			100
10	A	5	5	5	4	4	9.7	5.4	6.9	5.5	6.1	7.78	7.78	7.68	7.41	7.42	176	181	186	20.0	20.7	20.6	20.6	20.8	80
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
	D	5	5	5	5	5																			100
	E	5	4	4	4	4																			80
100	A	5	5	5	5	5	9.7	6.2	8.1	6.3	6.4	7.79	7.78	7.91	7.59	7.47	232	235	241	19.9	20.7	20.6	20.5	20.7	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
	D	5	5	5	5	5																			100
	E	5	5	5	4	4																			80
500	A	5	5	5	5	5	9.7	5.7	7.4	5.7	6.0	7.82	7.76	7.78	7.50	7.47	432	434	436	19.9	20.6	20.5	20.5	20.7	100
	B	5	5	5	5	4																			80
	C	5	5	5	5	5																			100
	D	5	5	5	5	5																			100
	E	5	5	5	5	5																			100
1,000	A	5	5	5	5	5	9.8	5.9	7.8	6.2	5.9	7.84	7.77	7.82	7.56	7.47	738	734	732	19.9	20.7	20.6	20.5	20.6	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
	D	5	5	4	4	4																			80
	E	5	5	5	5	5																			100
5,000	A	5	5	5	5	5	9.8	5.5	6.9	5.1	5.4	7.88	7.66	7.72	7.44	7.48	2860	2820	2800	19.9	20.6	20.5	20.4	20.6	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
	D	5	5	5	5	5																			100
	E	5	5	5	5	5																			100
10,000	A	5	5	5	5	5	9.8	6.1	7.8	4.5	4.8	7.91	7.71	7.78	7.36	7.40	5190	5140	5130	20.3	20.6	20.5	20.4	20.6	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
	D	5	5	5	5	5																			100
	E	5	5	5	5	5																			100

Acute Mosquito Larvae Bioassay-96 Hr Survival

Start Date: 04/15/2003	Test ID: 0304-136	Sample ID: BEAZER
End Date: 04/19/2003	Lab ID:	Sample Type: OTH-Other sample type
Sample Date:	Protocol: ASTM 96	Test Species: C P-Culex pipiens
Comments: Chemical testing - BMDSA Definitive		

Conc-mg/L	1	2	3	4	5
L-Lab Control	0.8000	1.0000	1.0000	1.0000	1.0000
10	0.8000	1.0000	1.0000	1.0000	0.8000
100	1.0000	1.0000	1.0000	1.0000	0.8000
500	1.0000	0.8000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	0.8000	1.0000
5000	1.0000	1.0000	1.0000	1.0000	1.0000
10000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-mg/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N			Mean	N-Mean
L-Lab Control	0.9600	1.0000	1.2977	1.1071	1.3453	8.207	5			0.9657	1.0000
10	0.9200	0.9583	1.2500	1.1071	1.3453	10.434	5	25.00	16.00	0.9657	1.0000
100	0.9600	1.0000	1.2977	1.1071	1.3453	8.207	5	27.50	16.00	0.9657	1.0000
500	0.9600	1.0000	1.2977	1.1071	1.3453	8.207	5	27.50	16.00	0.9657	1.0000
1000	0.9600	1.0000	1.2977	1.1071	1.3453	8.207	5	27.50	16.00	0.9657	1.0000
5000	1.0000	1.0417	1.3453	1.3453	1.3453	0.000	5	30.00	16.00	0.9657	1.0000
10000	1.0000	1.0417	1.3453	1.3453	1.3453	0.000	5	30.00	16.00	0.9657	1.0000

Auxiliary Tests

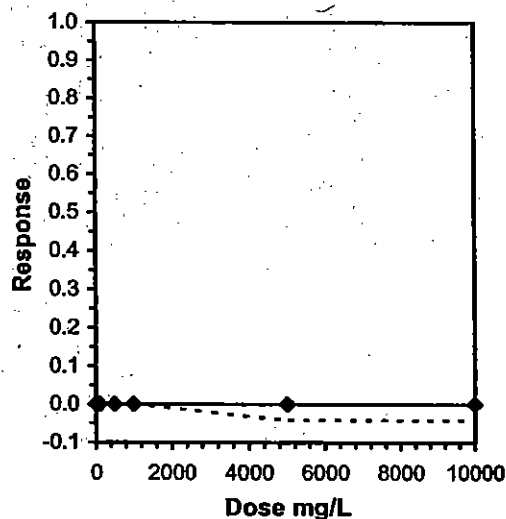
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	Statistic	Critical	Skew	Kurt
Equality of variance cannot be confirmed.	0.72469	0.91	-1.4473	0.90684

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
---------------------------------------	------	------	-----	----

Steel's Many-One Rank Test	10000	>10000
----------------------------	-------	--------

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Appendix Table C-9b.
Water Quality Summary for 96-hour *Culex pipiens*
Exposure to Benzene Monosulfonic Acid (BMSA)

Initiated: 15 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (umhos-cm)			Temperature (°C)					Percent Survival
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	48	96	0	24	48	72	96	
Lab Control	A	5	5	5	5	5	9.0	5.8	7.2	8.0	5.8	7.88	7.72	7.76	7.46	7.41	175	178	184	20.3	20.7	20.6	20.6	20.9	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
	D	5	5	5	5	5																			100
	E	5	5	5	5	5																			100
10	A	5	5	5	5	5	9.1	5.6	7.3	8.1	8.0	8.03	7.73	7.77	7.55	7.54	178	185	193	20.0	20.7	20.6	20.5	20.7	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
	D	5	5	5	5	5																			100
	E	5	5	5	4	3																			60
100	A	5	5	5	5	5	9.1	6.2	7.8	8.3	6.5	8.05	7.72	7.89	7.61	7.59	214	219	225	19.9	20.7	20.5	20.4	20.7	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
	D	5	5	5	5	5																			100
	E	5	5	5	5	5																			100
500	A	5	5	5	5	5	8.9	6.1	7.8	6.6	7.0	8.08	7.82	7.92	7.66	7.65	353	357	358	19.9	20.6	20.5	20.4	20.9	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
	D	5	5	5	5	5																			100
	E	5	5	5	5	5																			100
1,000	A	5	5	4	4	4	8.9	6.0	7.5	5.6	5.3	8.11	7.80	7.85	7.54	7.52	525	529	634	19.9	20.6	20.5	20.4	20.7	80
	B	5	5	5	5	5																			100
	C	5	4	4	4	4																			80
	D	5	5	5	5	5																			100
	E	5	5	5	5	5																			100
5,000	A	5	5	5	5	5	8.9	5.8	6.6	4.6	5.0	8.12	7.72	7.72	7.42	7.50	1928	1919	1920	19.9	20.5	20.5	20.4	20.8	100
	B	5	4	3	2	2																			40
	C	5	5	5	5	5																			100
	D	5	5	5	5	5																			100
	E	5	5	5	5	5																			100
10,000	A	5	5	5	5	5	9.0	6.0	7.7	5.8	5.0	8.11	7.75	7.81	7.51	7.32	3480	3490	3490	19.7	20.6	20.5	20.4	20.7	100
	B	5	5	4	4	4																			80
	C	5	5	5	5	5																			100
	D	5	5	5	5	5																			100
	E	5	5	5	4	4																			80

Acute Mosquito Larvae Bioassay-96 Hr Survival

Start Date: 04/15/2003	Test ID: 0304-137	Sample ID: BEAZER
End Date: 04/19/2003	Lab ID:	Sample Type: OTH-Other sample type
Sample Date:	Protocol: ASTM 96	Test Species: C P-Culex pipiens
Comments: Chemical testing - BMSA Definitive		

Conc-mg/L	1	2	3	4	5
L-Lab Control	1.0000	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000	0.6000
100	1.0000	1.0000	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000	1.0000	1.0000
1000	0.8000	1.0000	0.8000	1.0000	1.0000
5000	1.0000	0.4000	1.0000	1.0000	1.0000
10000	1.0000	0.8000	1.0000	1.0000	0.8000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
L-Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	5			0	25
10	0.9200	0.9200	1.2534	0.8861	1.3453	16.384	5	25.00	16.00	2	25
100	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00	0	25
500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00	0	25
1000	0.9200	0.9200	1.2500	1.1071	1.3453	10.434	5	22.50	16.00	2	25
5000	0.8800	0.8800	1.2132	0.6847	1.3453	24.351	5	25.00	16.00	3	25
10000	0.9200	0.9200	1.2500	1.1071	1.3453	10.434	5	22.50	16.00	2	25

Auxiliary Tests

Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	Statistic	Critical	Skew	Kurt
	0.73721	0.91	-2.2377	6.19159

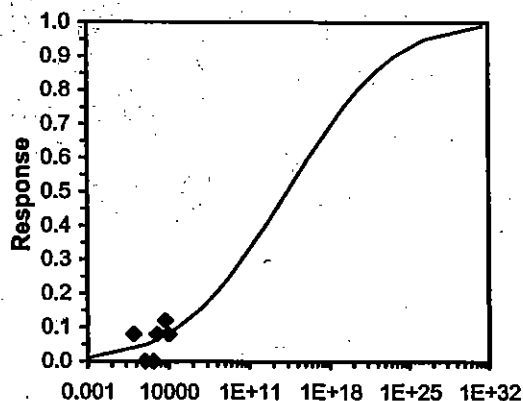
Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
---------------------------------------	-------------	-------------	------------	-----------

Steel's Many-One Rank Test	10000	>10000
----------------------------	-------	--------

Maximum Likelihood-Probit										
Parameter	Value	SE	95% Fiducial Limits	Control	Chl-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	0.13558	0.16981	-0.1972 0.4684	0	5.05549	9.48773	0.28	14.3072	7.37595	3
Intercept	3.06029	0.51952	2.04204 4.07854							
TSCR										

Point	Probits	mg/L	95% Fiducial Limits
EC01	2.674	0.00141	
EC05	3.355	149.569	
EC10	3.718	71538.5	
EC15	3.964	4597483	
EC20	4.158	1.3E+08	
EC25	4.326	2.1E+09	
EC40	4.747	2.7E+12	
EC50	5.000	2E+14	
EC60	5.253	1.5E+16	
EC75	5.674	1.9E+19	
EC80	5.842	#####	
EC85	6.036	#####	
EC90	6.282	#####	
EC95	6.645	#####	
EC99	7.326	#####	



Dose mg/L

Appendix Table C-9c.
Water Quality Summary for 96-hour *Culex pipiens*
Exposure to P-Phenol Sulfonic Acid (PSA)

Initiated: 15 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (umhos-cm)			Temperature (°C)					Percent Survival
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	48	96	0	24	48	72	96	
Lab Control	A	5	5	5	5	4	9.3	5.8	7.0	5.6	6.2	7.90	7.73	7.72	7.53	7.46	169	174	184	20.0	20.5	20.6	20.6	20.7	80
	B	5	5	5	4	4																			80
	C	5	5	5	5	5																			100
	D	5	5	4	4	3																			60
	E	5	5	5	5	5																			100
10	A	5	5	5	5	5	8.2	5.9	7.1	5.6	6.0	7.87	7.77	7.75	7.52	7.47	175	180	189	19.9	20.6	20.5	20.5	20.7	100
	B	5	4	4	3	3																			60
	C	5	5	5	5	5																			100
	D	5	5	5	5	4																			80
	E	5	5	5	3	3																			60
100	A	5	5	5	5	5	9.3	5.5	7.0	5.2	5.8	7.79	7.73	7.77	7.51	7.50	199	203	211	19.9	20.8	20.5	20.0	20.6	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
	D	5	5	5	5	5																			100
	E	5	5	5	5	5																			100
500	A	5	5	3	3	3	9.3	5.7	6.7	5.2	5.0	7.56	7.78	7.80	7.64	7.55	307	308	313	19.9	20.6	20.6	20.6	20.7	60
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
	D	5	5	5	5	5																			100
	E	5	5	5	5	5																			100
1,000	A	5	5	5	5	5	9.3	5.9	7.7	6.0	6.0	7.43	7.78	7.87	7.77	7.72	449	452	455	19.9	20.6	20.6	20.6	20.8	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	4																			80
	D	5	5	5	5	5																			100
	E	5	5	5	5	4																			80
5,000	A	5	5	5	5	5	9.3	6.0	8.0	6.0	4.6	7.03	7.41	7.56	7.55	7.45	1501	1499	1487	19.7	20.7	20.6	20.6	20.9	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
	D	5	4	4	4	4																			80
	E	5	5	5	5	5																			100
10,000	A	5	5	5	5	5	9.5	6.2	7.3	4.9	4.5	6.83	7.16	7.25	7.27	7.23	2850	2840	2830	19.1	20.7	20.7	20.6	20.9	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
	D	5	5	5	5	5																			100
	E	5	5	5	5	5																			100

Acute Mosquito Larvae Bioassay-96 Hr Survival

Start Date: 04/15/2003	Test ID: 0304-138	Sample ID: BEAZER
End Date: 04/19/2003	Lab ID:	Sample Type: OTH-Other sample type
Sample Date:	Protocol: ASTM 96	Test Species: C P-Culex pipiens
Comments: Chemical testing - PSA Definitive		

Conc-mg/L	1	2	3	4	5
L-Lab Control	0.8000	0.8000	1.0000	0.6000	1.0000
10	1.0000	0.6000	1.0000	0.8000	0.6000
100	1.0000	1.0000	1.0000	1.0000	1.0000
500	0.6000	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	0.8000	1.0000	0.8000
5000	1.0000	1.0000	1.0000	0.8000	1.0000
10000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-mg/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N			Mean	N-Mean
L-Lab Control	0.8400	1.0000	1.1582	0.8861	1.3453	16.679	5			0.9200	1.0000
10	0.8000	0.9524	1.1140	0.8861	1.3453	20.614	5	26.00	16.00	0.9200	1.0000
100	1.0000	1.1905	1.3453	1.3453	1.3453	0.000	5	35.00	16.00	0.9200	1.0000
500	0.9200	1.0952	1.2534	0.8861	1.3453	16.384	5	31.50	16.00	0.9200	1.0000
1000	0.9200	1.0952	1.2500	1.1071	1.3453	10.434	5	31.00	16.00	0.9200	1.0000
5000	0.9600	1.1429	1.2977	1.1071	1.3453	8.207	5	33.00	16.00	0.9200	1.0000
10000	1.0000	1.1905	1.3453	1.3453	1.3453	0.000	5	35.00	16.00	0.9200	1.0000

Auxillary Tests

Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	Statistic	Critical	Skew	Kurt
	0.92257	0.91	-0.7501	0.64763

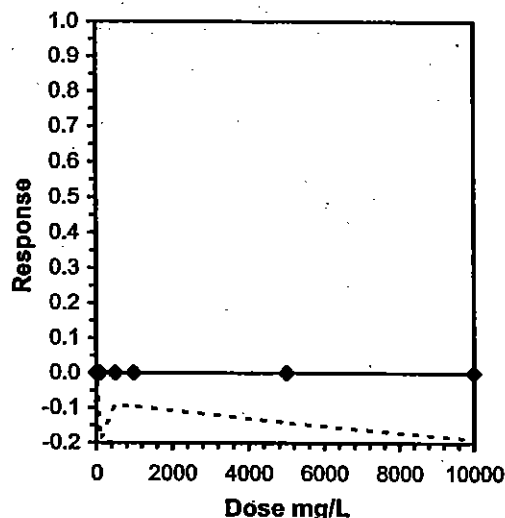
Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
---------------------------------------	-------------	-------------	------------	-----------

Steel's Many-One Rank Test	10000	>10000
----------------------------	-------	--------

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Oncorhynchus mykiss

Appendix Table C-10a.
Water Quality Summary for 96-hour *Oncorhynchus mykiss*
Exposure to Benzene Metadisulfonic Acid (BMDSA)

Initiated: 10 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)			Temperature (°C)					Percent Survival
		0	24	48	72	96	0	24*	48	72	96	0	24	48	72	96	0	48	96	0	24	48	72	96	
		10	10	10	10	10	9.4	6.0	9.1	8.9	9.8	8.00	7.42	7.76	7.81	7.84	202	191	204	11.3	13.8	13.6	13.5	13.4	100
Lab Control	A	10	10	10	10	10																			100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
10	A	10	10	10	10	10	9.4	5.7	8.7	8.3	9.1	8.04	7.48	7.70	7.72	7.80	211	198	211	11.4	13.7	13.5	13.5	13.4	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
100	A	10	10	10	10	10	9.4	5.3	8.5	8.4	9.4	8.05	7.48	7.69	7.73	7.88	266	249	259	12.0	13.8	13.5	13.5	13.3	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
500	A	10	10	10	10	10	9.4	5.1	8.4	8.2	8.8	8.07	7.51	7.69	7.73	7.81	511	455	471	12.2	13.9	13.5	13.5	13.4	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
1,000	A	10	10	10	10	10	9.3	5.5	7.7	7.3	7.7	8.13	7.48	7.67	7.67	7.72	824	724	737	12.6	13.9	13.6	13.5	13.4	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
5,000	A	10	10	10	10	10	9.3	5.0	7.3	6.2	5.8	8.17	7.48	7.67	7.65	7.68	3050	2630	2650	12.6	13.9	13.6	13.5	13.5	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
10,000	A	10	10	10	10	10	9.5	5.0	8.6	8.3	8.7	8.14	7.49	7.79	7.75	7.82	5810	5030	5060	12.2	13.9	13.5	13.4	13.4	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100

* - test aerated

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Acute Fish Test-96 Hr Survival

Start Date: 04/10/2003	Test ID: 0304-133	Sample ID: BEAZER
End Date: 04/14/2003	Lab ID:	Sample Type: OTH-Other sample type
Sample Date:	Protocol: EPAA 91-EPA Acute	Test Species: OM-Oncorhynchus mykiss
Comments: Chemical testing - BMDSA Definitive		

Conc-mg/L	1	2	3	4
L-Lab Control	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000
5000	1.0000	1.0000	1.0000	1.0000
10000	1.0000	1.0000	1.0000	1.0000

Conc-mg/L	Transform: Arcsin Square Root						Rank Sum	1-Tailed Critical	Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%			Mean	N-Mean
L-Lab Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4		1.0000	1.0000
10	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000
100	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000
500	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000
1000	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000
5000	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000
10000	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000

Auxiliary Tests

Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)

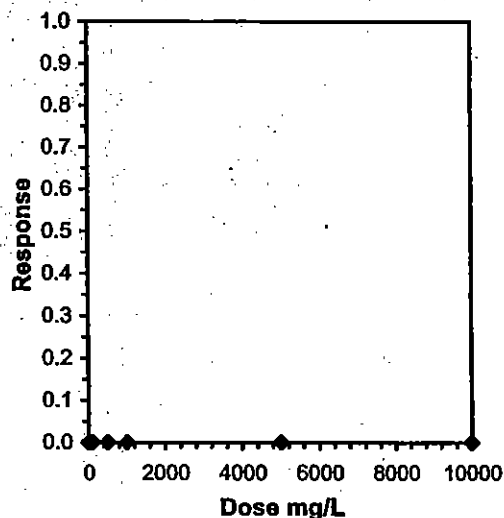
Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
---------------------------------------	-------------	-------------	------------	-----------

Steel's Many-One Rank Test	10000	>10000
----------------------------	-------	--------

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Appendix Table C-10b.

**Water Quality Summary for 96-hour *Oncorhynchus mykiss*
Exposure to Benzene Monosulfonic Acid (BMSA)**

Initiated: 10 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)			Temperature (°C)					Percent Survival
		0	24	48	72	96	0	24*	48	72	96	0	24	48	72	96	0	48	96	0	24	48	72	96	
Lab Control	A	10	10	10	10	10	9.4	5.5	9.2	9.0	9.4	8.12	7.44	7.63	7.84	7.86	202	189	216	12.8	14.3	13.9	13.2	13.4	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
10	A	10	10	10	10	10	9.3	5.3	8.6	6.8	8.8	8.14	7.44	7.61	7.63	7.77	208	198	213	12.0	14.2	13.2	13.0	12.9	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
100	A	10	10	10	10	10	9.3	4.6	8.9	8.7	9.6	8.14	7.44	7.64	7.89	7.91	245	231	250	12.2	14.2	13.1	12.9	12.9	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
500	A	10	10	10	10	10	9.3	5.0	9.4	9.0	9.9	8.15	7.47	7.76	7.98	8.02	414	379	398	12.5	14.1	13.0	12.8	12.7	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
1,000	A	10	10	10	10	10	9.3	4.8	9.7	9.3	10.0	8.14	7.47	7.89	8.07	8.11	615	545	564	12.0	14.1	13.0	12.7	12.8	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
5,000	A	10	10	10	10	10	9.3	4.7	9.1	5.8	5.7	8.15	7.48	7.80	7.61	7.60	2140	1844	1878	12.0	14.0	12.9	12.8	12.7	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
10,000	A	10	10	10	10	10	9.4	4.4	7.5	8.4	8.8	8.11	7.46	7.64	7.82	7.82	4080	3540	3600	11.7	13.8	13.0	12.9	12.9	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100

* - test aerated

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Acute Fish Test-96 Hr Survival

Start Date: 04/10/2003	Test ID: 0304-134	Sample ID: BEAZER
End Date: 04/14/2003	Lab ID:	Sample Type: OTH-Other sample type
Sample Date:	Protocol: EPAA 91-EPA Acute	Test Species: OM-Oncorhynchus mykiss
Comments: Chemical testing - BMSA Definitive		

Conc-mg/L	1	2	3	4
L-Lab Control	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000
5000	1.0000	1.0000	1.0000	1.0000
10000	1.0000	1.0000	1.0000	1.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%	N			Mean	N-Mean
L-Lab Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			1.0000	1.0000
10	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000	1.0000
100	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000	1.0000
500	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000	1.0000
1000	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000	1.0000
5000	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000	1.0000
10000	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000	1.0000

Auxiliary Tests

Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)

Equality of variance cannot be confirmed

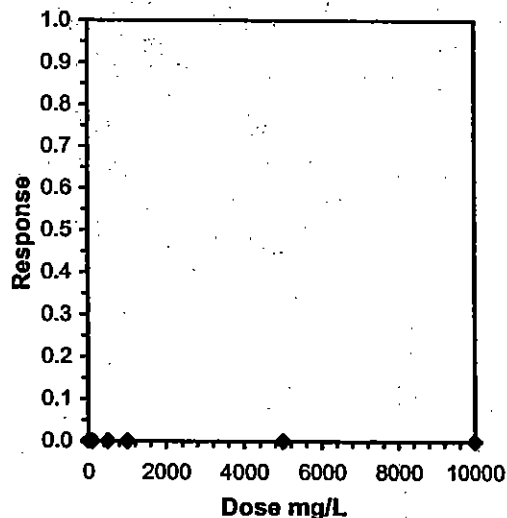
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
---------------------------------------	-------------	-------------	------------	-----------

Steel's Many-One Rank Test	10000	>10000		
----------------------------	-------	--------	--	--

Statistic	Critical	Skew	Kurt
1	0.896		

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Appendix Table C-10c.
Water Quality Summary for 96-hour *Oncorhynchus mykiss*
Exposure to P-Phenol Sulfonic Acid (PSA)

Initiated: 10 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)			Temperature (°C)					Percent Survival
		0	24	48	72	96	0	24*	48	72	96	0	24	48	72	96	0	48	96	0	24	48	72	96	
	A	10	10	10	10	10	9.4	5.9	8.2	7.9	8.4	8.06	7.67	7.59	7.54	7.53	201	192	222	11.6	14.2	13.2	13.1	13.1	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
10	A	10	10	10	10	10	9.3	5.8	8.4	8.1	8.8	8.02	7.64	7.62	7.65	7.66	206	196	208	11.8	14.0	13.1	13.0	13.1	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
100	A	10	10	10	10	10	9.3	5.6	8.9	8.9	9.5	7.88	7.61	7.78	7.85	7.85	234	221	237	12.3	14.1	13.0	12.9	13.0	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
500	A	10	10	10	10	10	9.1	5.0	9.0	8.7	9.3	7.62	7.52	7.77	7.80	7.83	358	325	337	12.2	14.0	13.0	13.0	13.0	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
1,000	A	10	10	6	6	6	9.2	5.3	9.2	8.9	9.8	7.48	7.49	7.82	7.85	7.99	514	493	514	12.3	14.0	13.1	13.0	13.0	.60
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100
5,000	A	10	10	10	10	10	9.3	5.5	9.0	8.7	9.5	7.12	7.33	7.53	7.57	7.67	1717	1501	1522	12.0	14.0	13.1	12.9	13.0	100
	B	10	10	10	10	10																			100
	C	10	0	0	0	0																			0
	D	10	10	10	10	10																			100
10,000	A	10	10	10	10	10	9.6	4.5	8.4	7.5	8.9	6.88	7.15	7.32	7.32	7.47	3160	2760	2800	12.0	14.0	13.1	13.1	13.0	100
	B	10	10	10	10	10																			100
	C	10	10	10	10	10																			100
	D	10	10	10	10	10																			100

* - test aerated

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Acute Fish Test-96 Hr Survival

Start Date: 04/10/2003 Test ID: 0304-135 Sample ID: BEAZER
End Date: 04/14/2003 Lab ID: Sample Type: OTH-Other sample type
Sample Date: Protocol: EPAA 91-EPA Acute Test Species: OM-Oncorhynchus mykiss
Comments: Chemical testing - PSA Definitive

Conc-mg/L	1	2	3	4
L-Lab Control	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000	1.0000
1000	0.6000	1.0000	1.0000	1.0000
5000	1.0000	1.0000	0.0000	1.0000
10000	1.0000	1.0000	1.0000	1.0000

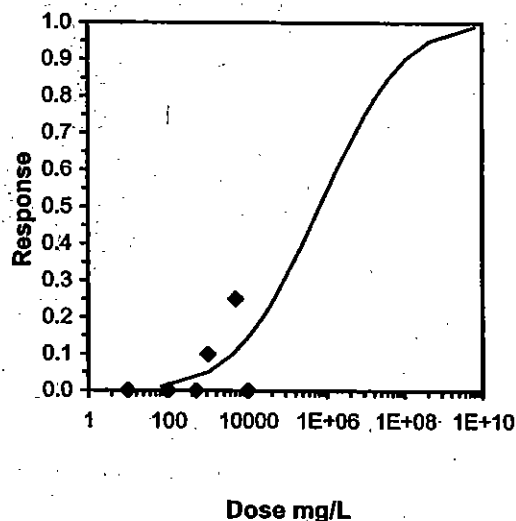
Conc-mg/L	Transform: Arcsin Square Root						Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%				
L-Lab Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4		0	40
10	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	0	40
100	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	0	40
500	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	0	40
1000	0.9000	0.9000	1.2805	0.8861	1.4120	20.536	4	16.00	4	40
5000	0.7500	0.7500	1.0987	0.1588	1.4120	57.032	4	16.00	10	40
10000	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	0	40

Auxiliary Tests		Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$)		0.59321	0.896	-2.7202	11.3006
Equality of variance cannot be confirmed					
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	
Steel's Many-One Rank Test	10000	>10000			

Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	0.5833	0.44576	-0.6543	1.82094	0	19.3443	9.48773	6.7E-04	5.82461	1.71437	5
Intercept	1.60248	1.53538	-2.6604	5.86538							
TSCR											
Point	Probits	mg/L	95% Fiducial Limits								
EC01	2.674	68.6103									
EC05	3.355	1010.94									
EC10	3.718	4241.88									
EC15	3.964	11163									
EC20	4.158	24085.9									
EC25	4.326	46589.5									
EC40	4.747	245631									
EC50	5.000	667750									
EC60	5.253	1815285									
EC75	5.674	9570610									
EC80	5.842	1.9E+07									
EC85	6.036	4E+07									
EC90	6.282	1.1E+08									
EC95	6.645	4.4E+08									
EC99	7.326	6.5E+09									

Point	Probits	mg/L	Response
EC01	2.674	68.6103	0.0
EC05	3.355	1010.94	0.0
EC10	3.718	4241.88	0.0
EC15	3.964	11163	0.0
EC20	4.158	24085.9	0.0
EC25	4.326	46589.5	0.0
EC40	4.747	245631	0.0
EC50	5.000	667750	0.0
EC60	5.253	1815285	0.0
EC75	5.674	9570610	0.1
EC80	5.842	1.9E+07	0.25
EC85	6.036	4E+07	0.9
EC90	6.282	1.1E+08	1.0
EC95	6.645	4.4E+08	1.0
EC99	7.326	6.5E+09	1.0

Significant heterogeneity detected ($p = 6.72E-04$)



Lepomis macrochirus

Appendix Table C-11a.
Water Quality Summary for 96-hour *Lepomis macrochirus*
Exposure to Benzene Metadisulfonic Acid (BMDSA)

Initiated: 30 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)			Temperature (°C)					Percent Survival
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	48	96	0	24	48	72	96	
Lab Control	A	5	5	5	5	5	7.7	2.2	8.5	6.6	6.6	7.92	7.40	7.93	7.94	7.90	763	771	793	21.0	20.6	20.4	20.3	20.4	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
10	A	5	5	5	5	5	7.7	1.0	9.4	7.9	7.7	7.90	7.36	8.07	8.09	8.14	767	775	792	21.0	20.6	20.3	20.3	20.1	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
100	A	5	5	5	5	5	7.7	1.1	7.0	6.5	6.8	7.90	7.38	7.81	7.85	7.91	820	831	858	21.0	20.5	20.4	20.5	20.3	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
500	A	5	5	5	5	5	7.7	1.4	9.4	7.7	7.6	7.90	7.40	8.09	8.08	8.13	1040	1046	1063	21.0	20.4	20.4	20.4	20.3	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
1,000	A	5	5	5	5	5	7.8	1.3	8.3	6.7	6.6	7.91	7.42	7.94	7.87	7.87	1304	1313	1331	21.0	20.6	20.5	20.4	20.3	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
5,000	A	5	5	5	5	5	7.8	1.2	8.3	7.2	6.4	7.89	7.47	8.00	7.92	7.90	3230	3250	3290	20.9	20.6	20.4	20.4	20.3	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
10,000	A	5	5	5	5	5	7.8	1.9	1.8	4.6	6.7	7.89	7.40	7.69	7.68	7.93	5650	5650	5710	20.8	20.6	20.5	20.5	20.1	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100

* - test aerated

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Acute Fish Test-96 Hr Survival

Start Date: 04/30/2003 Test ID: 0304-205 Sample ID: BEAZER
 End Date: 05/04/2003 Lab ID: Sample Type: OTH-Other sample type
 Sample Date: Protocol: ASTM E1241 Test Species: LM-Lepomis macrochirus
 Comments: Chemical testing - BMDSA Definitive

Conc-mg/L	1	2
L-Lab Control	1.0000	1.0000
10	1.0000	1.0000
100	1.0000	1.0000
500	1.0000	1.0000
1000	1.0000	1.0000
5000	1.0000	1.0000
10000	1.0000	1.0000

Conc-mg/L	Transform: Arcsin Square Root							Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
L-Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
10	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
100	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
1000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
5000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
10000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000

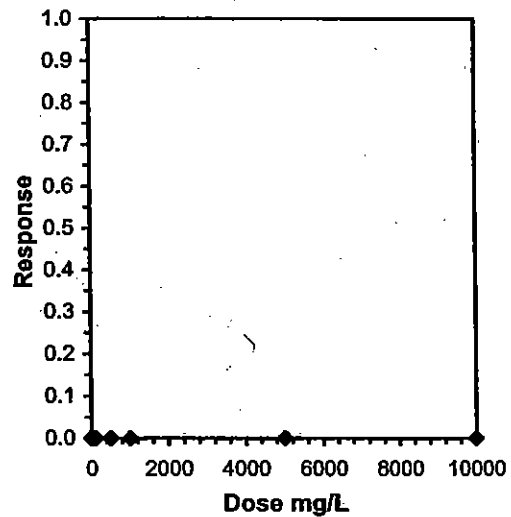
Auxiliary Tests

Normality of the data set cannot be confirmed
 Equality of variance cannot be confirmed

Statistic Critical Skew Kurt

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Appendix Table C-11b.
Water Quality Summary for 96-hour *Lepomis macrochirus*
Exposure to Benzene Monosulfonic Acid (BMSA)

Initiated: 30 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)			Temperature (°C)					Percent Survival
		0	24	48	72	96	0	24*	48	72	96	0	24	48	72	96	0	48	96	0	24	48	72	96	
Lab Control	A	5	5	5	5	5	7.8	5.3	6.8	6.1	6.6	7.85	7.61	7.71	7.79	8.00	760	771	792	20.7	20.7	20.6	20.6	19.9	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
10	A	5	5	5	5	5	7.7	5.5	6.0	5.8	5.0	7.84	7.62	7.69	7.74	7.75	771	784	800	20.7	20.7	20.6	20.6	20.4	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
100	A	5	5	5	5	5	7.7	5.8	6.2	5.7	4.3	7.86	7.66	7.72	7.74	7.73	804	814	824	20.7	20.7	20.6	20.6	20.3	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
500	A	5	5	5	5	5	7.7	5.6	5.1	4.6	4.5	7.85	7.69	7.64	7.65	7.70	943	950	966	20.7	20.6	20.5	20.6	20.3	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
1,000	A	5	5	5	5	5	7.7	6.0	5.0	4.9	4.9	7.85	7.74	7.61	7.66	7.71	1152	1164	1186	20.7	20.5	20.5	20.6	20.3	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
5,000	A	5	5	5	5	5	7.7	6.0	5.4	5.1	4.5	7.83	7.79	7.67	7.70	7.67	2570	2590	2600	20.6	20.6	20.5	20.6	20.4	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100
10,000	A	5	5	5	5	5	7.7	6.4	6.7	6.0	6.0	7.81	7.83	7.78	7.77	7.87	4330	4270	4320	20.5	20.6	20.5	20.5	20.1	100
	B	5	5	5	5	5																			100
	C	5	5	5	5	5																			100

* - test aerated

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Acute Fish Test-96 Hr Survival

Start Date: 04/30/2003	Test ID: 0304-206	Sample ID: BEAZER
End Date: 05/04/2003	Lab ID:	Sample Type: OTH-Other sample type
Sample Date:	Protocol: ASTM E1241	Test Species: LM-Lepomis macrochirus
Comments: Chemical testing - BMSA Definitive		

Conc-mg/L	1	2
L-Lab Control	1.0000	1.0000
10	1.0000	1.0000
100	1.0000	1.0000
500	1.0000	1.0000
1000	1.0000	1.0000
5000	1.0000	1.0000
10000	1.0000	1.0000

Conc-mg/L	Transform: Arcsin Square Root							Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
L-Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
10	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
100	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
1000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
5000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
10000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000

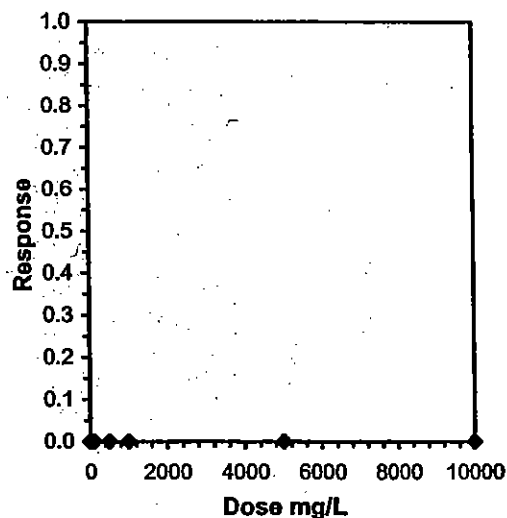
Auxiliary Tests

Normality of the data set cannot be confirmed
 Equality of variance cannot be confirmed

Statistic Critical Skew Kurt

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Appendix Table C-11c.
Water Quality Summary for 96-hour *Lepomis macrochirus*
Exposure to P-Phenol Sulfonic Acid (PSA)

Initiated: 30 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (pH units)					Conductivity (µmhos-cm)			Temperature (°C)					Percent Survival
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	48	96	0	24	48	72	96	
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	48	96	0	24	48	72	96	100
	A	5	5	5	5	5	7.7	2.2	8.5	6.6	6.6	7.92	7.40	7.93	7.94	7.90	763	771	793						100
	B	5	5	5	5	5																		100	
	C	5	5	5	5	5																		100	
10	A	5	5	5	5	5	9.1	1.6	9.2	7.8	8.0	8.41	7.60	7.89	7.99	7.99	779	789	802	21.0	20.6	20.3	20.3	20.4	100
	B	5	5	5	5	5																		100	
	C	5	5	5	5	5																		100	
100	A	5	5	5	5	5	9.1	2.7	6.8	6.1	6.3	8.19	7.54	7.82	7.79	7.92	805	818	826	21.0	20.5	20.2	20.2	20.4	100
	B	5	5	5	5	5																		100	
	C	5	5	5	5	5																		100	
500	A	5	5	5	5	5	9.2	1.9	7.0	6.1	6.0	7.81	7.56	7.81	7.86	7.94	920	930	966	20.9	20.5	20.2	20.2	20.4	100
	B	5	5	5	5	5																		100	
	C	5	5	5	5	5																		100	
1,000	A	5	5	5	5	5	9.2	3.6	8.3	7.2	6.6	7.61	7.60	7.90	7.91	7.95	1059	1068	1092	20.9	20.5	20.2	20.2	20.4	100
	B	5	5	5	5	5																		100	
	C	5	5	5	5	5																		100	
5,000	A	5	5	5	5	5	9.1	3.0	7.6	6.4	6.6	7.14	7.42	7.66	7.65	7.68	2130	2140	2170	20.8	20.6	20.2	20.2	20.1	100
	B	5	5	5	5	5																		100	
	C	5	5	5	5	5																		100	
10,000	A	5	5	5	5	5	9.2	3.2	8.6	6.9	6.7	6.93	7.40	7.50	7.48	7.52	3320	3340	3390	20.4	20.5	20.2	20.2	20.1	100
	B	5	5	5	5	5																		100	
	C	5	5	5	5	5																		100	

• - test aerated

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Acute Fish Test-96 Hr Survival

Start Date: 04/30/2003	Test ID: 0304-207	Sample ID: BEAZER
End Date: 05/04/2003	Lab ID:	Sample Type: OTH-Other sample type
Sample Date:	Protocol: ASTM E1241	Test Species: LM-Lepomis macrochirus
Comments: Chemical testing - PSA Definitive		

Conc-mg/L	1	2
L-Lab Control	1.0000	1.0000
10	1.0000	1.0000
100	1.0000	1.0000
500	1.0000	1.0000
1000	1.0000	1.0000
5000	1.0000	1.0000
10000	1.0000	1.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					Isotonic	
			Mean	Min	Max	CV%	N	Mean	N-Mean
L-Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
10	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
100	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
1000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
5000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000
10000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	1.0000	1.0000

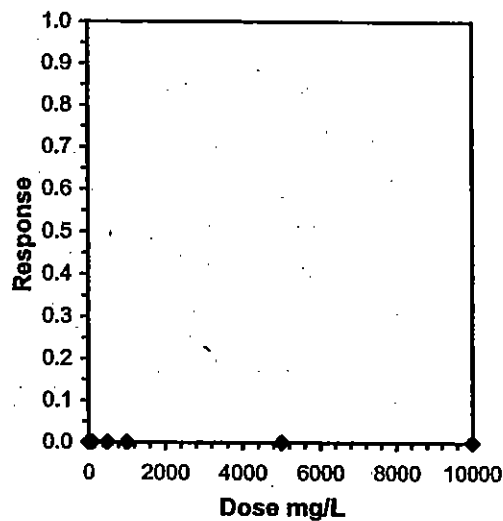
Auxiliary Tests

Normality of the data set cannot be confirmed
 Equality of variance cannot be confirmed

Statistic Critical Skew Kurt

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>10000			
IC10	>10000			
IC15	>10000			
IC20	>10000			
IC25	>10000			
IC40	>10000			
IC50	>10000			



Brachionus calyciflorus

Acute Exposure

5

Appendix Table C-12a.
Water Quality Summary for 24-hour *Brachionus calyciflorus*
Exposure to Benzene Metadisulfonic Acid (BMDSA)

Initiated: 11 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms		DO (mg/L)		pH (pH units)		Cond. (mmhos/cm)		Temperature (°C)		Percent Survival
		0	24	0	24	0	24	0	24	0	24	
Control	A	5	5	7.8	7.6	7.99	8.06	306	311	25.6	25.0	100
	B	5	5									100
	C	5	5									100
	D	5	5									100
	E	5	5									100
	F	5	5									100
	G	5	5									100
	H	5	5									100
625	A	5	5	7.4	7.2	7.93	8.00	718	721	25.8	25.0	100
	B	5	5									100
	C	5	5									100
	D	5	5									100
	E	5	5									100
	F	5	5									100
	G	5	5									100
	H	5	5									100
1,250	A	5	5	7.6	7.6	7.91	7.97	1114	1121	25.9	25.1	100
	B	5	5									100
	C	5	5									100
	D	5	5									100
	E	5	5									100
	F	5	5									100
	G	5	5									100
	H	5	5									100
2,500	A	5	5	7.7	7.5	7.96	7.97	1823	1830	24.9	25.1	100
	B	5	5									100
	C	5	5									100
	D	5	5									100
	E	5	5									100
	F	5	5									100
	G	5	5									100
	H	5	5									100
5,000	A	5	4	7.4	7.5	7.98	7.98	3240	3260	25.7	25.0	80
	B	5	4									80
	C	5	5									100
	D	5	5									100
	E	5	4									80
	F	5	5									100
	G	5	5									100
	H	5	4									80
10,000	A	5	0	7.4	7.3	7.98	7.98	5870	5890	25.2	25.0	0
	B	5	0									0
	C	5	0									0
	D	5	0									0
	E	5	0									0
	F	5	0									0
	G	5	0									0
	H	5	0									0

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Rotifer Test-24 Hr Survival

Start Date: 4/11/03 Test ID: 0304-18NW Sample ID: Beazer
 End Date: 4/12/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: BMDSA-benzene metadisulfonic acid
 Sample Date: 4/11/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus
 Comments:

Conc-mg/L	1	2	3	4	5	6	7	8
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
625	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1250	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2500	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5000	0.8000	0.8000	1.0000	1.0000	0.8000	1.0000	1.0000	0.8000
10000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Number Resp	Total Number
			Mean	Min	Max	CV%	N				
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8			0	40
625	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8	68.00	46.00	0	40
1250	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8	68.00	46.00	0	40
2500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8	68.00	46.00	0	40
5000	0.9000	0.9000	1.2262	1.1071	1.3453	10.381	8	52.00	46.00	4	40
*10000	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	8	36.00	46.00	40	40

Auxiliary Tests

Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$) 0.57448 0.929 1.5E-14 3.47391

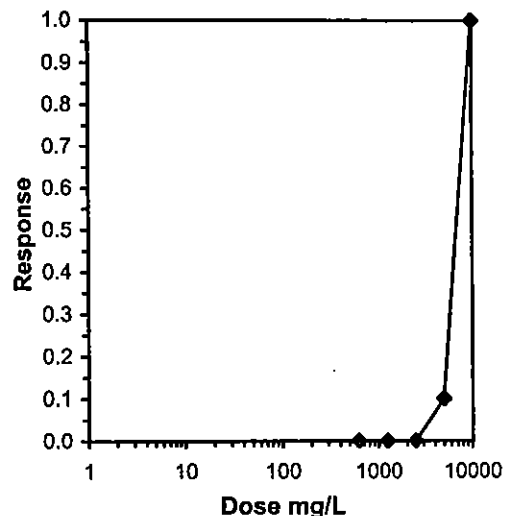
Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05) NOEC LOEC ChV TU

Steel's Many-One Rank Test 5000 10000 7071.07

Trimmed Spearman-Kärber

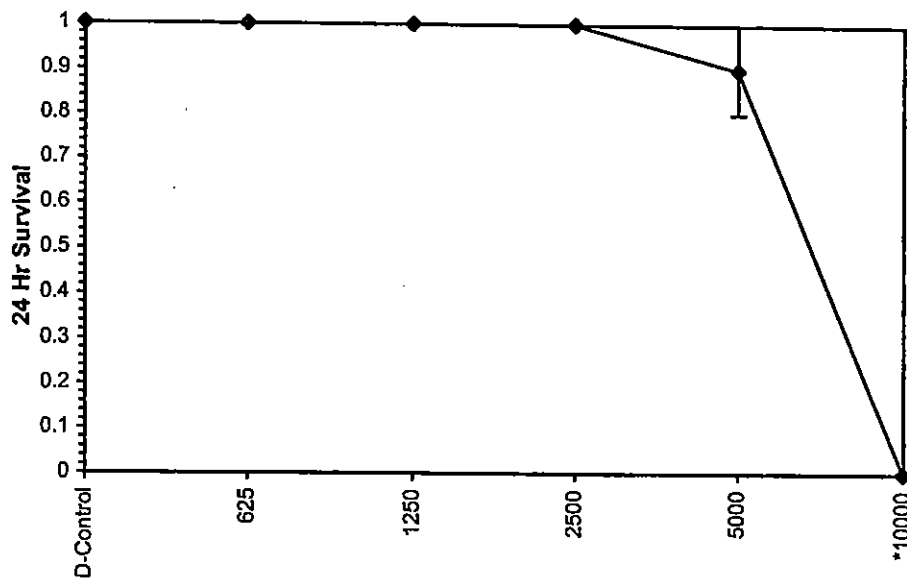
Trim Level	EC50	95% CL	
0.0%	6597.54	6177.66	7045.96
5.0%	6745.97	6214.35	7323.08
10.0%	6803.95	6533.3	7085.81
20.0%	6803.95	6533.3	7085.81
Auto-0.0%	6597.54	6177.66	7045.96



Rotifer Test-24 Hr Survival

Start Date: 4/11/03	Test ID: 0304-18NW	Sample ID:	Beazer
End Date: 4/12/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type:	BMDSA-benzene metadisulfonic acid
Sample Date: 4/11/03	Protocol: ASTM E1440	Test Species:	BC-Brachionus calyciflorus
Comments:			

Dose-Response Plot



Appendix Table C-12b.
Water Quality Summary for 24-hour *Brachionus calyciflorus*
Exposure to Benzene Monosulfonic Acid (BMSA)

Initiated: 11 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms		DO (mg/L)		pH (pH units)		Cond. (mmhos/cm)		Temperature (°C)		Percent Survival
		0	24	0	24	0	24	0	24	0	24	
Control	A	5	5	7.8	7.5	7.99	8.06	306	311	25.6	25.2	100
	B	5	5									100
	C	5	5									100
	D	5	5									100
	E	5	5									100
	F	5	5									100
	G	5	5									100
	H	5	5									100
625	A	5	5	7.5	7.5	7.94	7.99	586	590	25.0	25.0	100
	B	5	5									100
	C	5	5									100
	D	5	5									100
	E	5	5									100
	F	5	5									100
	G	5	5									100
	H	5	5									100
1,250	A	5	5	7.3	7.2	7.91	7.99	862	872	25.1	25.1	100
	B	5	5									100
	C	5	5									100
	D	5	5									100
	E	5	5									100
	F	5	5									100
	G	5	5									100
	H	5	5									100
2,500	A	5	5	7.7	7.4	7.99	7.98	1365	1375	25.4	25.1	100
	B	5	5									100
	C	5	4									80
	D	5	5									100
	E	5	5									100
	F	5	5									100
	G	5	5									100
	H	5	5									100
5,000	A	5	5	7.8	7.4	7.98	8.00	2350	2360	25.4	25.0	100
	B	5	5									100
	C	5	5									100
	D	5	5									100
	E	5	5									100
	F	5	5									100
	G	5	5									100
	H	5	5									100
10,000	A	5	0	7.3	7.1	7.98	8.00	4230	4300	25.6	25.1	0
	B	5	0									0
	C	5	0									0
	D	5	0									0
	E	5	0									0
	F	5	0									0
	G	5	0									0
	H	5	0									0

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Rotifer Test-24 Hr Survival

Start Date: 4/11/03 Test ID: 0304-20NW Sample ID: Beazer
End Date: 4/12/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: BMSA-benzene monosulfonic acid
Sample Date: 4/11/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus
Comments:

Conc-mg/L	1	2	3	4	5	6	7	8
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
625	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1250	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2500	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000
5000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Number Resp	Total Number
			Mean	Min	Max	CV%	N				
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8			0	40
625	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8	68.00	46.00	0	40
1250	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8	68.00	46.00	0	40
2500	0.9750	0.9750	1.3155	1.1071	1.3453	6.400	8	64.00	46.00	1	40
5000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8	68.00	46.00	0	40
*10000	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	8	36.00	46.00	40	40

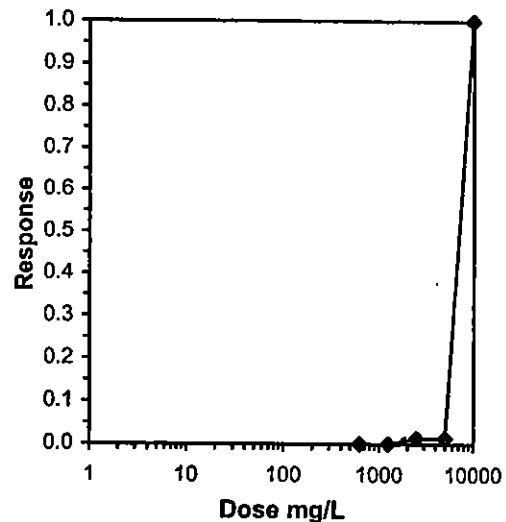
Auxiliary Tests

Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$) Statistic: 0.32014 Critical: 0.929 Skew: -5.7357 Kurt: 37.8043
Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	5000	10000	7071.07	

Trimmed Spearman-Kärber

Trim Level	EC50	95% CL
0.0%	6949.59	6714.32 7193.1
5.0%	7040.11	6952.75 7128.57
10.0%	7040.11	6952.75 7128.57
20.0%	7040.11	6952.75 7128.57
Auto-0.0%	6949.59	6714.32 7193.1



Rotifer Test-24 Hr Survival

Start Date: 4/11/03

Test ID: 0304-20NW

Sample ID:

Beazer

End Date: 4/12/03

Lab ID: WAAEE-AMEC NW Bioassay

Sample Type:

BMSA-benzene monosulfonic acid

Sample Date: 4/11/03

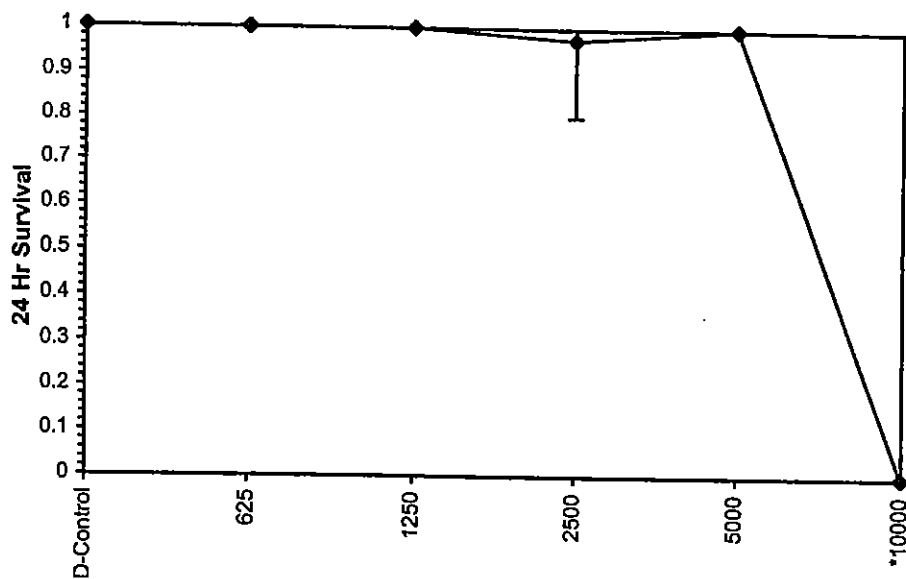
Protocol: ASTM E1440

Test Species:

BC-Brachionus calyciflorus

Comments:

Dose-Response Plot



Appendix Table C-12c.
Water Quality Summary for 24-hour *Brachionus calyciflorus*
Exposure to P-Phenol Sulfonic Acid (PSA)

Initiated: 11 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms		DO (mg/L)		pH (pH units)		Cond. (mmhos/cm)		Temperature (°C)		Percent Survival
		0	24	0	24	0	24	0	24	0	24	
Control	A	5	5	7.8	7.5	7.99	8.06	306	311	25.6	25.3	100
	B	5	5									100
	C	5	5									100
	D	5	5									100
	E	5	5									100
	F	5	5									100
	G	5	5									100
	H	5	5									100
1,250	A	5	5	7.5	7.6	7.45	7.80	725	733	25.8	25.3	100
	B	5	5									100
	C	5	5									100
	D	5	5									100
	E	5	5									100
	F	5	5									100
	G	5	5									100
	H	5	5									100
2,500	A	5	5	7.9	7.7	7.28	7.40	1077	1080	25.9	25.1	100
	B	5	5									100
	C	5	5									100
	D	5	5									100
	E	5	5									100
	F	5	5									100
	G	5	5									100
	H	5	5									100
5,000	A	5	5	7.5	7.6	7.13	7.21	1804	1821	25.3	25.1	100
	B	5	5									100
	C	5	5									100
	D	5	5									100
	E	5	5									100
	F	5	5									100
	G	5	5									100
	H	5	5									100
10,000	A	5	3	7.8	7.4	6.92	7.11	3190	3190	25.3	25.0	60
	B	5	2									40
	C	5	3									60
	D	5	3									60
	E	5	2									40
	F	5	3									60
	G	5	2									40
	H	5	3									60
20,000	A	5	0	7.8	7.4	6.65	6.72	5720	5790	25.0	25.3	0
	B	5	0									0
	C	5	0									0
	D	5	0									0
	E	5	0									0
	F	5	0									0
	G	5	0									0
	H	5	0									0

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Rotifer Test-24 Hr Survival

Start Date: 4/11/03 Test ID: 0304-22NW Sample ID: Beazer
nd Date: 4/12/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: PSA-p-phenol sulfonic acid
Sample Date: 4/11/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus

Comments:

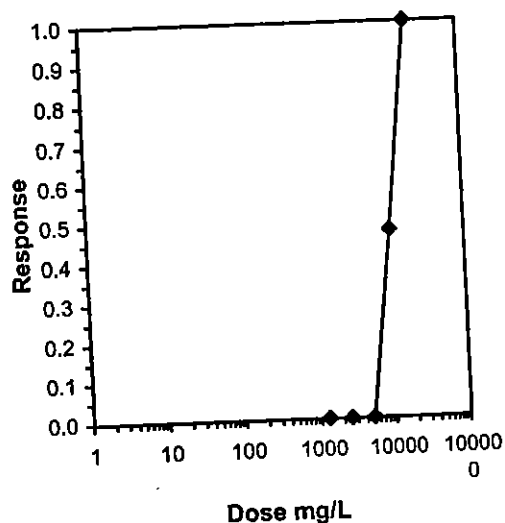
Conc-mg/L	1	2	3	4	5	6	7	8
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1250	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2500	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10000	0.6000	0.4000	0.6000	0.6000	0.4000	0.6000	0.4000	0.6000
20000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Transform: Arcsin Square Root								Rank	1-Tailed	Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8			0	40
1250	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8	68.00	46.00	0	40
2500	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8	68.00	46.00	0	40
5000	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8	68.00	46.00	0	40
*10000	0.5250	0.5250	0.8106	0.6847	0.8861	12.857	8	36.00	46.00	19	40
*20000	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	8	36.00	46.00	40	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$)	0.54799	0.929	-1.3061	5.25401
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	5000	10000	7071.07	

Trimmed Spearman-Kärber

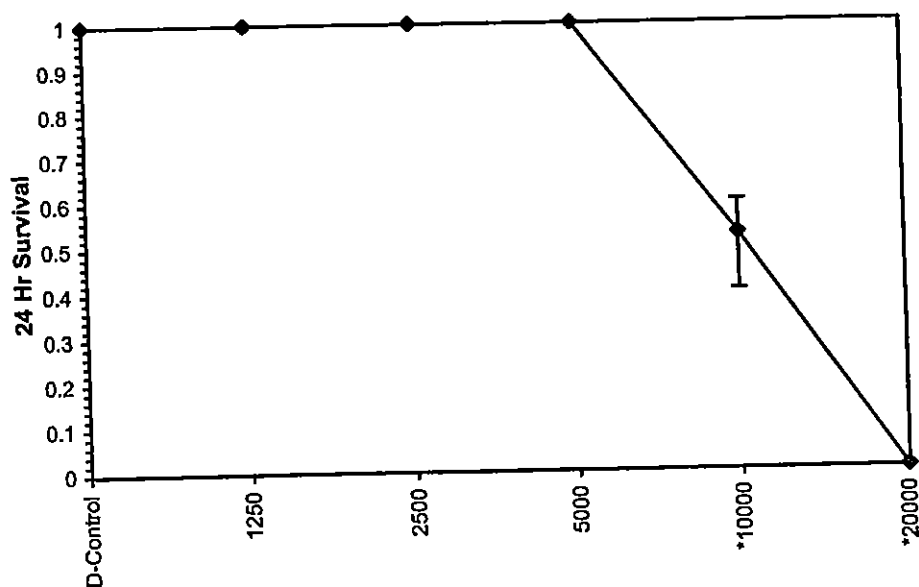
Trim Level	EC50	95% CL
0.0%	10174.8	9119.86 11351.8
5.0%	10192.4	9024.14 11512
10.0%	10210.1	8899.57 11713.6
20.0%	10245.4	8511.93 12332
Auto-0.0%	10174.8	9119.86 11351.8



Rotifer Test-24 Hr Survival

Start Date: 4/11/03	Test ID: 0304-22NW	Sample ID: Beazer
End Date: 4/12/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: PSA-p-phenol sulfonic acid
Sample Date: 4/11/03	Protocol: ASTM E1440	Test Species: BC-Brachionus calyciflorus
Comments:		

Dose-Response Plot



Brachionus calyciflorus

Chronic Exposure

Appendix Table C-13a.
Water Quality Summary for 48-hour *Brachionus calyciflorus*
Exposure to Benzene Metadisulfonic Acid (BMDSA)

Initiated: 11 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms		DO (mg/L)		pH (pH units)		Cond. (mmhos/cm)		Temperature (°C)	
		0	48	0	48	0	48	0	48	0	48
Control	A	1	6	7.8	7.5	7.99	8.07	306	315	25.6	25.0
	B	1	6								
	C	1	5								
	D	1	8								
	E	1	6								
	F	1	5								
	G	1	4								
	H	1	6								
625	A	1	8	7.4	7.5	7.93	8.00	718	722	25.8	25.0
	B	1	8								
	C	1	7								
	D	1	6								
	E	1	7								
	F	1	6								
	G	1	7								
	H	1	8								
1,250	A	1	8	7.6	7.2	7.91	7.98	1114	1121	25.9	25.0
	B	1	4								
	C	1	6								
	D	1	0								
	E	1	6								
	F	1	4								
	G	1	6								
	H	1	5								
2,500	A	1	4	7.7	7.2	7.96	7.98	1823	1900	24.9	25.0
	B	1	3								
	C	1	4								
	D	1	6								
	E	1	8								
	F	1	6								
	G	1	7								
	H	1	8								
5,000	A	1	6	7.4	7.1	7.98	7.96	3240	3250	25.7	25.0
	B	1	6								
	C	1	7								
	D	1	8								
	E	1	6								
	F	1	8								
	G	1	5								
	H	1	5								
10,000	A	1	0	7.4	7.4	7.98	7.97	5870	5890	25.2	25.0
	B	1	1								
	C	1	0								
	D	1	2								
	E	1	0								
	F	1	4								
	G	1	2								
	H	1	0								

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Rotifer Test-Net Production

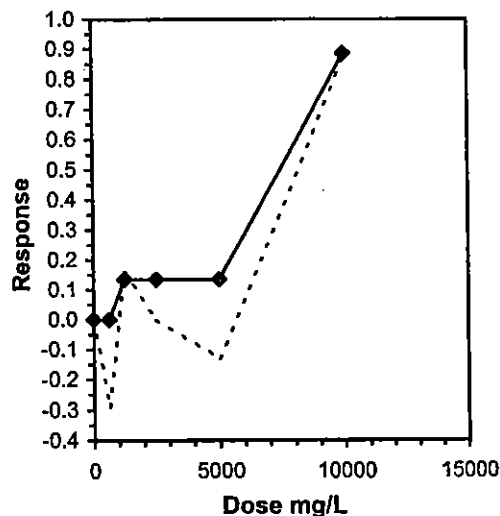
Start Date: 4/11/03 Test ID: 0304-19NW Sample ID: BEAZER
End Date: 4/13/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: BMDSA-benzene metadisulfonic acid
Sample Date: 4/11/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus
Comments:

Conc-mg/L	1	2	3	4	5	6	7	8
D-Control	5.0000	5.0000	4.0000	7.0000	5.0000	4.0000	3.0000	5.0000
625	7.0000	7.0000	6.0000	5.0000	6.0000	5.0000	6.0000	7.0000
1250	7.0000	3.0000	5.0000	0.0000	5.0000	3.0000	5.0000	4.0000
2500	3.0000	2.0000	3.0000	5.0000	7.0000	5.0000	6.0000	7.0000
5000	5.0000	5.0000	6.0000	7.0000	5.0000	7.0000	4.0000	4.0000
10000	0.0000	0.0000	0.0000	1.0000	0.0000	3.0000	1.0000	0.0000

Conc-mg/L	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
D-Control	4.7500	1.0000	4.7500	3.0000	7.0000	24.526	8				5.4375	1.0000
625	6.1250	1.2895	6.1250	5.0000	7.0000	13.625	8	-1.904	2.306	1.6652	5.4375	1.0000
1250	4.0000	0.8421	4.0000	0.0000	7.0000	51.755	8	1.038	2.306	1.6652	4.7083	0.8659
2500	4.7500	1.0000	4.7500	2.0000	7.0000	40.182	8	0.000	2.306	1.6652	4.7083	0.8659
5000	5.3750	1.1316	5.3750	4.0000	7.0000	22.097	8	-0.865	2.306	1.6652	4.7083	0.8659
*10000	0.6250	0.1316	0.6250	0.0000	3.0000	169.706	8	5.712	2.306	1.6652	0.6250	0.1149

Auxillary Tests					Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)					0.98036	0.929	-0.1971	0.73659
Bartlett's Test indicates equal variances ($p = 0.14$)					8.34819	15.0863		
Hypothesis Test (1-tail, 0.05)					NOEC	LOEC	ChV	TU
Dunnett's Test					5000	10000	7071.07	
					MSDu	MSDp	MSB	MSE
					1.66519	0.35057	29.5708	2.08631
					F-Prob	df		
					3.9E-08	5, 42		

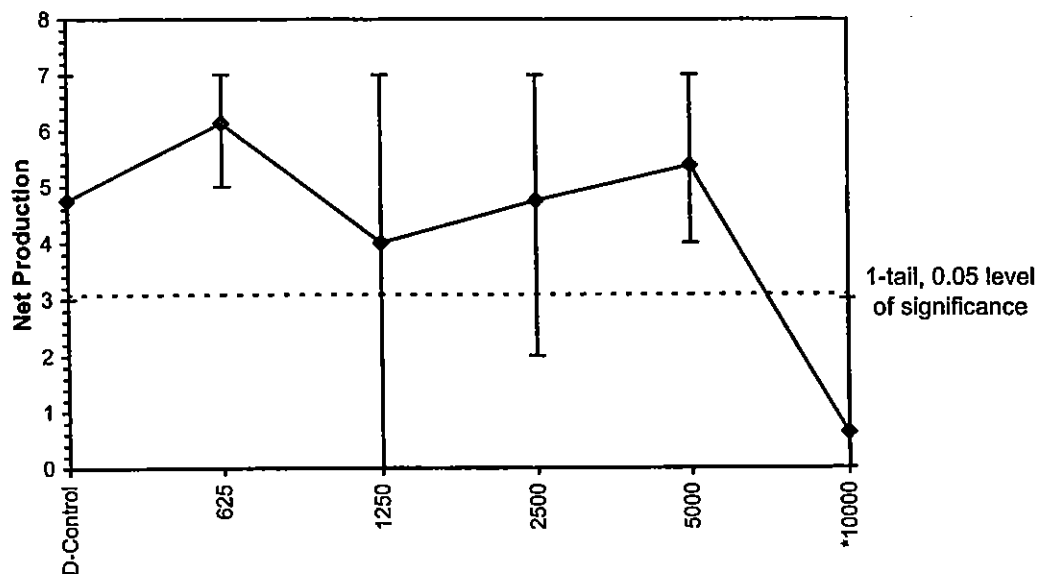
Linear Interpolation (200 Resamples)					
Point	mg/L	SD	95% CL		Skew
IC05	858.036	1341.65	745.14	5269.44	2.4647
IC10	1091.07	1956.08	865.281	5561.87	0.7990
IC15	5105.87	2110.4	985.421	5843.81	-0.2517
IC20	5438.78	1716.1	1105.56	6128.8	-1.5117
IC25	5771.68	1270.07	1225.7	6411.11	-2.7593
IC40	6770.41	346.789	6102.4	7396.87	-0.1275
IC50	7436.22	322.338	6855.25	8078.19	0.0556



Rotifer Test-Net Production

Start Date: 4/11/03	Test ID: 0304-19NW	Sample ID: BEAZER
End Date: 4/13/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BMDSA-benzene metadisulfonic acid
Sample Date: 4/11/03	Protocol: ASTM E1440	Test Species: BC-Brachionus calyciflorus
Comments:		

Dose-Response Plot



Rotifer Test-r

Start Date: 4/11/03 Test ID: 0304-19NW Sample ID: Beazer
 nd Date: 4/13/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: BMDSA-benzene metadisulfonic acid
 Sample Date: 4/11/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus

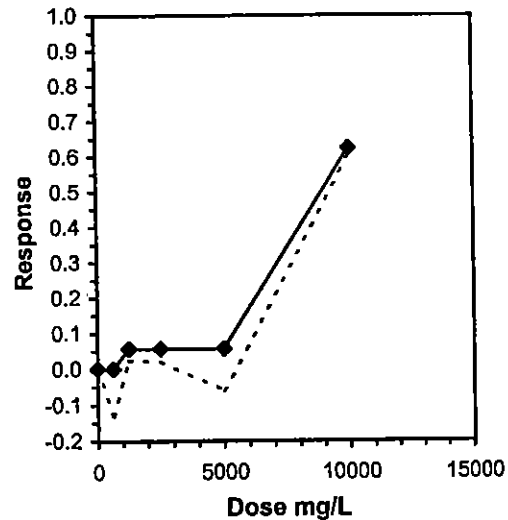
Comments:

Conc-mg/L	1	2	3	4	5	6	7	8
D-Control	0.8959	0.8959	0.8047	1.0397	0.8959	0.8047	0.6931	0.8959
625	1.0397	1.0397	0.9730	0.8959	0.9730	0.8959	0.9730	1.0397
1250	1.0397	0.6931	0.8959	0.8959	0.6931	0.8959	0.8047	
2500	0.6931	0.5493	0.6931	0.8959	1.0397	0.8959	0.9730	1.0397
5000	0.8959	0.8959	0.9730	1.0397	0.8959	1.0397	0.8047	0.8047
10000	0.0000	0.3466	0.6931	0.3466				

Conc-mg/L	Transform: Untransformed							1-Tailed		Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean
D-Control	0.8657	1.0000	0.8657	0.6931	1.0397	11.645	8				0.9222
625	0.9787	1.1305	0.9787	0.8959	1.0397	6.105	8	-1.620	2.431	0.1696	0.9222
1250	0.8455	0.9766	0.8455	0.6931	1.0397	14.759	7	0.280	2.431	0.1756	0.8705
2500	0.8475	0.9789	0.8475	0.5493	1.0397	21.430	8	0.262	2.431	0.1696	0.8705
5000	0.9187	1.0612	0.9187	0.8047	1.0397	10.059	8	-0.759	2.431	0.1696	0.8705
*10000	0.3466	0.4003	0.3466	0.0000	0.6931	81.650	4	6.076	2.431	0.2078	0.3466

Auxiliary Tests					Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.97338	0.923	-0.1871	1.08162
Bartlett's Test indicates equal variances (p = 0.01)					14.5901	15.0863		
Hypothesis Test (1-tail, 0.05)					MSDu	MSDp	MSB	MSE
Bonferroni t Test					0.20777	0.23999	0.23664	0.01947
	NOEC	LOEC	ChV	TU			F-Prob	df
	5000	10000	7071.07				5.3E-07	5, 37

Linear Interpolation (200 Resamples)					
Point	mg/L	SD	95% CL	Skew	
C05	1182.65	1974.43	897.493	5472.09	0.5180
C10	5386.87	1388.6	1169.99	5993.23	-2.0138
IC15	5826.89	361.006	5145.46	6686.94	0.6401
IC20	6266.91	423.779	5651.67	7370.96	1.0030
C25	6706.92	516.73	6046.82	8235.82	1.1556
C40	8026.97				
IC50	8907.01				

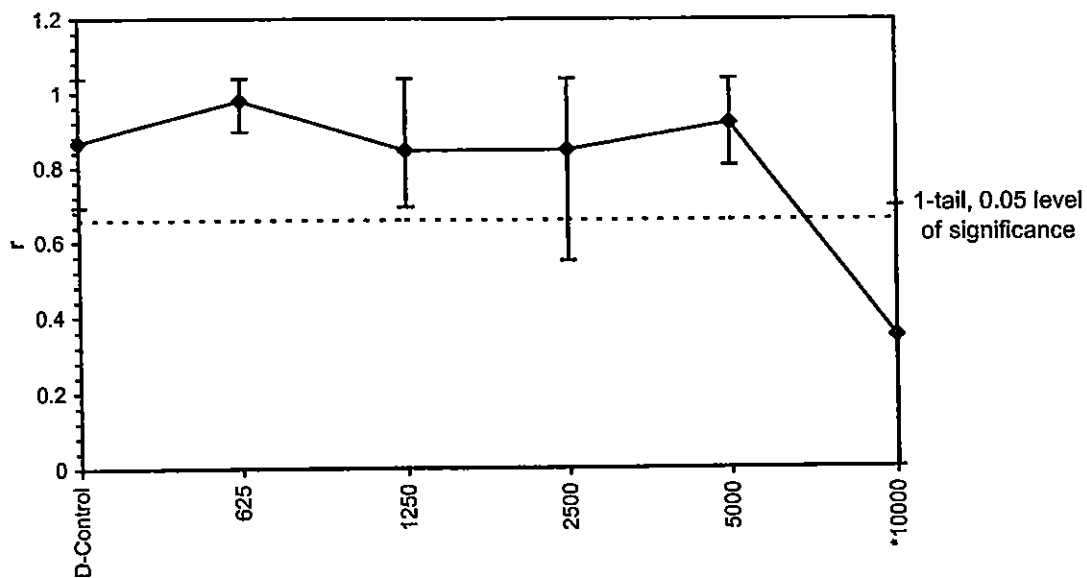


Rotifer Test-r

Start Date: 4/11/03	Test ID: 0304-19NW	Sample ID:	Beazer
nd Date: 4/13/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type:	BMDSA-benzene metadisulfonic acid
ample Date: 4/11/03	Protocol: ASTM E1440	Test Species:	BC-Brachionus calyciflorus

Comments:

Dose-Response Plot



Appendix Table C-13b.
Water Quality Summary for 48-hour *Brachionus calyciflorus*
Exposure to Benzene Monosulfonic Acid (BMSA)

Initiated: 11 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms		DO (mg/L)		pH (pH units)		Cond. (mmhos/cm)		Temperature (°C)		
		0	48	0	48	0	48	0	48	0	48	
Control	A	1	5	7.8	7.5	7.99	8.06	306	311	25.6	25.1	
	B	1	5									
	C	1	5									
	D	1	5									
	E	1	5									
	F	1	5									
	G	1	5									
	H	1	5									
625	A	1	5	7.5	7.4	7.94	7.99	586	594	25.0	25.1	
	B	1	5									
	C	1	5									
	D	1	5									
	E	1	5									
	F	1	5									
	G	1	5									
	H	1	5									
1,250	A	1	5	7.3	7.3	7.91	7.95	862	880	25.1	25.4	
	B	1	5									
	C	1	5									
	D	1	5									
	E	1	5									
	F	1	5									
	G	1	5									
	H	1	5									
2,500	A	1	5	7.7	7.0	7.99	7.90	1365	1410	25.4	25.3	
	B	1	5									
	C	1	4									
	D	1	5									
	E	1	5									
	F	1	5									
	G	1	5									
	H	1	5									
5,000	A	1	5	7.8	7.0	7.98	7.90	2350	2400	25.4	25.1	
	B	1	5									
	C	1	5									
	D	1	5									
	E	1	5									
	F	1	5									
	G	1	5									
	H	1	5									
10,000	A	1	0	7.3	7.1	7.98	7.92	4230	4300	25.6	25.1	
	B	1	0									
	C	1	0									
	D	1	0									
	E	1	0									
	F	1	0									
	G	1	0									
	H	1	0									

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Rotifer Test-Net Production

Start Date: 4/11/03 Test ID: 0304-21NW Sample ID: BEAZER
End Date: 4/13/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: BMSA-benzene monosulfonic acid
Sample Date: 4/11/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus
Comments:

Conc-mg/L	1	2	3	4	5	6	7	8
D-Control	4.0000	7.0000	4.0000	6.0000	5.0000	5.0000	8.0000	8.0000
625	5.0000	4.0000	4.0000	4.0000	4.0000	4.0000	6.0000	7.0000
1250	6.0000	5.0000	8.0000	4.0000	4.0000	6.0000	2.0000	4.0000
2500	5.0000	5.0000	5.0000	3.0000	0.0000	5.0000	6.0000	7.0000
5000	4.0000	5.0000	4.0000	3.0000	4.0000	5.0000	4.0000	4.0000
10000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-mg/L	Transform: Untransformed							Rank Sum	1-Tailed Critical	Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N			Mean	N-Mean
D-Control	5.8750	1.0000	5.8750	4.0000	8.0000	27.950	8			5.8750	1.0000
625	4.7500	0.8085	4.7500	4.0000	7.0000	24.526	8	54.00	46.00	4.8125	0.8191
1250	4.8750	0.8298	4.8750	2.0000	8.0000	37.081	8	58.00	46.00	4.8125	0.8191
2500	4.5000	0.7660	4.5000	0.0000	7.0000	47.513	8	58.00	46.00	4.5000	0.7660
5000	4.1250	0.7021	4.1250	3.0000	5.0000	15.536	8	47.00	46.00	4.1250	0.7021
*10000	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	8	36.00	46.00	0.0000	0.0000

Auxiliary Tests

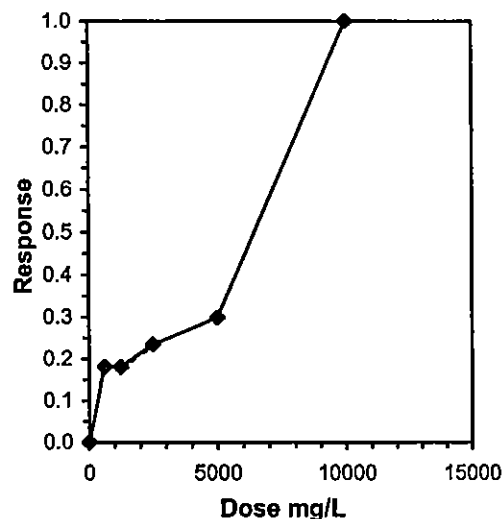
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$) 0.95562 0.929 -0.4489 2.04601
Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05) NOEC LOEC ChV TU
Steel's Many-One Rank Test 5000 10000 7071.07

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05*	172.794	684.662	105.36	2729.21	2.3665
IC10*	345.588	978.56	210.719	3420.54	1.9049
IC15*	518.382	1318.42	316.079	5000.54	1.3438
IC20	1700	1602.92	421.438	5294.62	0.6292
IC25	3125	1731.15	526.798	5588.71	-0.0211
IC40	5727.27	1005.65	2073.82	6470.97	-2.7248
IC50	6439.39	398.916	5416.04	7059.14	-0.6762

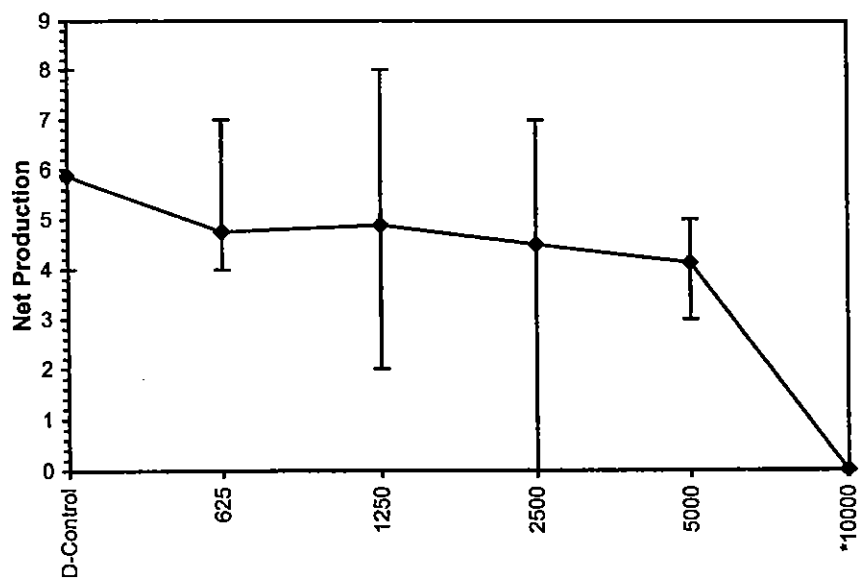
* indicates IC estimate less than the lowest concentration



Rotifer Test-Net Production

Start Date: 4/11/03	Test ID: 0304-21NW	Sample ID: BEAZER
End Date: 4/13/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BMSA-benzene monosulfonic acid
Sample Date: 4/11/03	Protocol: ASTM E1440	Test Species: BC-Brachionus calyciflorus
Comments:		

Dose-Response Plot



Rotifer Test-r

Start Date: 4/11/03 Test ID: 0304-21NW Sample ID: Beazer
End Date: 4/13/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: BMSA-benzene monosulfonic acid
Sample Date: 4/11/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus
Comments:

Conc-mg/L	1	2	3	4	5	6	7	8
D-Control	0.8047	1.0397	0.8047	0.9730	0.8959	0.8959	1.0986	1.0986
625	0.8959	0.8047	0.8047	0.8047	0.8047	0.8047	0.9730	1.0397
1250	0.9730	0.8959	1.0986	0.8047	0.8047	0.9730	0.5493	0.8047
2500	0.8959	0.8959	0.8959	0.6931	0.8959	0.9730	1.0397	
5000	0.8047	0.8959	0.8047	0.6931	0.8047	0.8959	0.8047	0.8047

Conc-mg/L	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	0.9514	1.0000	0.9514	0.8047	1.0986	12.613	8				0.9514	1.0000
625	0.8665	0.9108	0.8665	0.8047	1.0397	10.798	8	1.479	2.345	0.1345	0.8760	0.9208
1250	0.8630	0.9071	0.8630	0.5493	1.0986	19.059	8	1.541	2.345	0.1345	0.8760	0.9208
2500	0.8985	0.9444	0.8985	0.6931	1.0397	11.821	7	0.891	2.345	0.1393	0.8760	0.9208
*5000	0.8136	0.8551	0.8136	0.6931	0.8959	7.835	8	2.402	2.345	0.1345	0.8136	0.8551

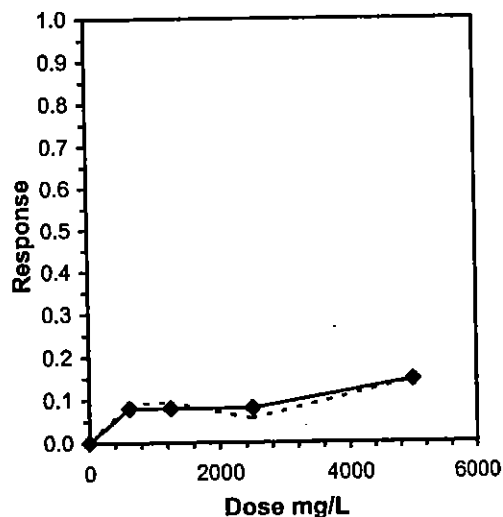
Auxiliary Tests

Auxiliary Tests											
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)					0.96741	0.917			-0.3485	0.89038	
Bartlett's Test indicates equal variances ($p = 0.20$)					5.98634	13.2767					
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test		2500	5000	3535.53		0.13453	0.14141	0.02052	0.01316	0.20755	4, 34

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL	Skew
IC05*	394.339			
IC10	3290.66			
IC15	>5000			
IC20	>5000			
IC25	>5000			
IC40	>5000			
IC50	>5000			

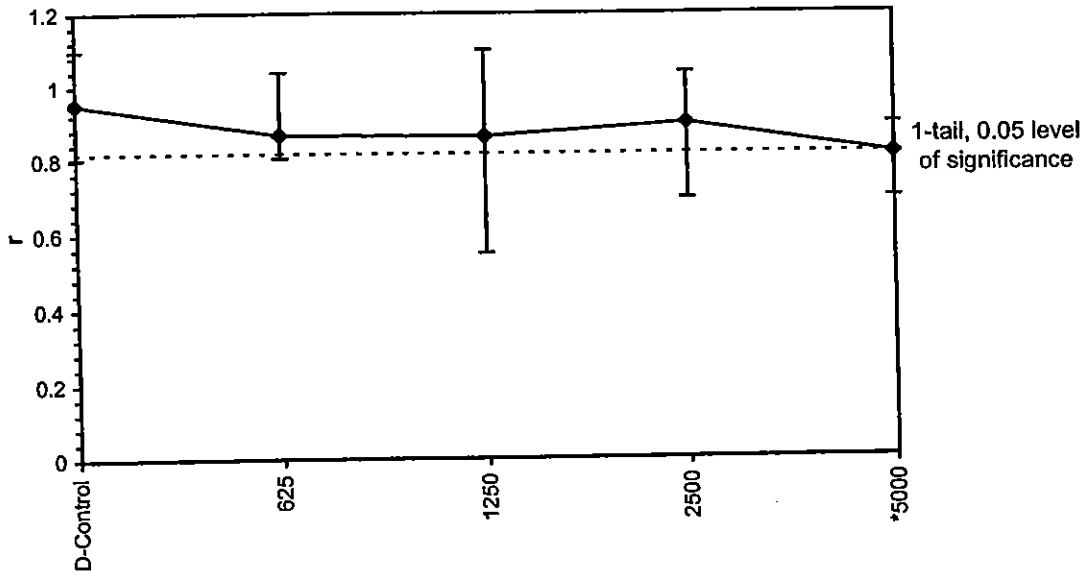
* indicates IC estimate less than the lowest concentration



Rotifer Test-r

Start Date: 4/11/03	Test ID: 0304-21NW	Sample ID: Beazer
End Date: 4/13/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BMSA-benzene monosulfonic acid
Sample Date: 4/11/03	Protocol: ASTM E1440	Test Species: BC-Brachionus calyciflorus
Comments:		

Dose-Response Plot



Appendix Table C-13c.
Water Quality Summary for 48-hour *Brachionus calyciflorus*
Exposure to P-Phenol Sulfonic Acid (PSA)

Initiated: 11 April 2003

Concentration (mg/L)	Rep	Number of Live Organisms		DO (mg/L)		pH (pH units)		Cond. (mmhos/cm)		Temperature (°C)	
		0	48	0	48	0	48	0	48	0	48
Control	A	1	7	7.8	7.5	7.99	8.06	306	315	25.6	25.1
	B	1	7								
	C	1	7								
	D	1	4								
	E	1	4								
	F	1	4								
	G	1	4								
	H	1	3								
1,250	A	1	2	7.5	7.3	7.94	8.07	586	592	25.0	25.0
	B	1	7								
	C	1	2								
	D	1	5								
	E	1	7								
	F	1	4								
	G	1	6								
	H	1	10								
2,500	A	1	8	7.3	7.3	7.91	8.06	862	868	25.1	25.1
	B	1	8								
	C	1	8								
	D	1	8								
	E	1	9								
	F	1	0								
	G	1	6								
	H	1	2								
5,000	A	1	8	7.7	7.2	7.99	8.05	1365	1380	25.4	25.2
	B	1	6								
	C	1	6								
	D	1	3								
	E	1	9								
	F	1	6								
	G	1	7								
	H	1	8								
10,000	A	1	3	7.8	7.1	7.98	8.00	2350	2390	25.4	25.0
	B	1	0								
	C	1	0								
	D	1	1								
	E	1	0								
	F	1	0								
	G	1	4								
	H	1	0								
20,000	A	1	0	7.3	7.2	7.98	8.01	4230	4300	25.6	25.0
	B	1	0								
	C	1	0								
	D	1	0								
	E	1	0								
	F	1	0								
	G	1	0								
	H	1	0								

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

Rotifer Test-Net Production

Start Date: 4/11/03 Test ID: 0304-23NW Sample ID: BEAZER
 End Date: 4/13/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: PSA-p-phenol sulfonic acid
 Sample Date: 4/11/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus
 Comments:

Conc-mg/L	1	2	3	4	5	6	7	8
D-Control	6.0000	6.0000	6.0000	3.0000	3.0000	3.0000	3.0000	2.0000
1250	1.0000	6.0000	1.0000	4.0000	6.0000	3.0000	5.0000	9.0000
2500	7.0000	7.0000	7.0000	7.0000	8.0000	0.0000	5.0000	1.0000
5000	7.0000	5.0000	5.0000	2.0000	8.0000	5.0000	6.0000	7.0000
10000	2.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	0.0000
20000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-mg/L	Transform: Untransformed							Rank Sum	1-Tailed Critical	Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N			Mean	N-Mean
D-Control	4.0000	1.0000	4.0000	2.0000	6.0000	42.258	8			4.8125	1.0000
1250	4.3750	1.0938	4.3750	1.0000	9.0000	62.223	8	70.00	46.00	4.8125	1.0000
2500	5.2500	1.3125	5.2500	0.0000	8.0000	58.266	8	81.00	46.00	4.8125	1.0000
5000	5.6250	1.4063	5.6250	2.0000	8.0000	32.832	8	82.00	46.00	4.8125	1.0000
*10000	0.6250	0.1563	0.6250	0.0000	3.0000	190.038	8	39.50	46.00	0.6250	0.1299
*20000	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	8	36.00	46.00	0.0000	0.0000

Auxiliary Tests

Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)

Statistic

0.94786

Critical

0.929

Skew

-0.4928

Kurt

0.86859

Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)

NOEC

LOEC

ChV

TU

Steel's Many-One Rank Test

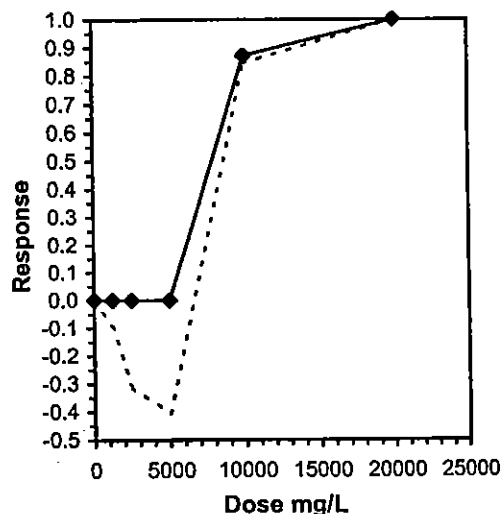
5000

10000

7071.07

Linear Interpolation (200 Resamples)

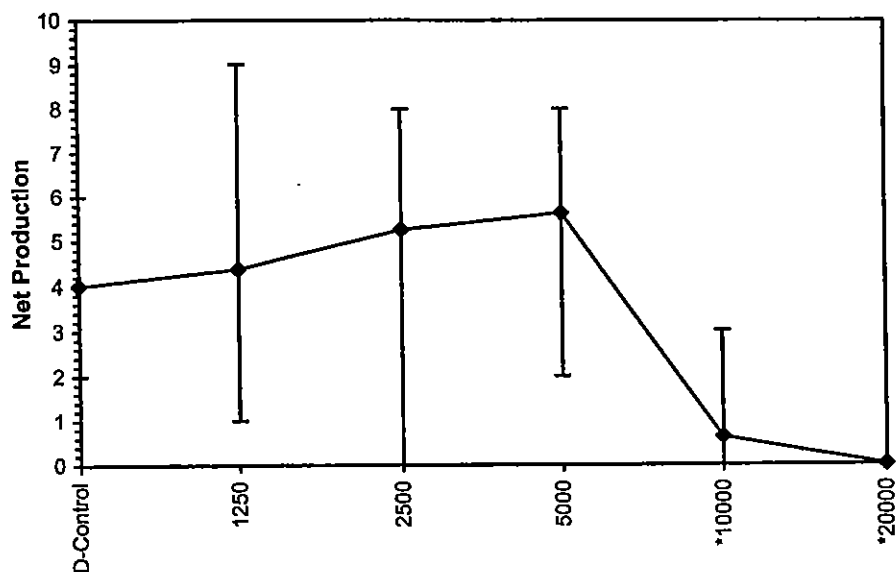
Point	mg/L	SD	95% CL		Skew
IC05	5287.31	1011.27	1512.13	5336.67	-2.9846
IC10	5574.63	668.741	3657.14	5673.34	-5.0626
IC15	5861.94	347.017	5045.69	6010.01	-6.8171
IC20	6149.25	342.039	5378.97	6346.68	-6.9276
IC25	6436.57	234.129	5710.56	6683.36	-1.6342
IC40	7298.51	252.293	6705.35	7693.37	-0.0782
IC50	7873.13	281.563	7284.78	8366.71	0.4411



Rotifer Test-Net Production

Start Date: 4/11/03	Test ID: 0304-23NW	Sample ID: BEAZER
End Date: 4/13/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: PSA-p-phenol sulfonic acid
Sample Date: 4/11/03	Protocol: ASTM E1440	Test Species: BC-Brachionus calyciflorus
Comments:		

Dose-Response Plot



Rotifer Test-r

Start Date: 4/11/03 Test ID: 0304-23NW Sample ID: Beazer
nd Date: 4/13/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: PSA-p-phenol sulfonic acid
Sample Date: 4/11/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus
Comments:

Conc-mg/L	1	2	3	4	5	6	7	8
D-Control	0.9730	0.9730	0.9730	0.6931	0.6931	0.6931	0.6931	0.5493
1250	0.3466	0.9730	0.3466	0.8047	0.9730	0.6931	0.8959	1.1513
2500	1.0397	1.0397	1.0397	1.0397	1.0986	0.8959	0.3466	
5000	1.0397	0.8959	0.8959	0.5493	1.0986	0.8959	0.9730	1.0397
10000	0.5493	0.0000	0.6931					

Conc-mg/L	Mean	N-Mean	Transform: Untransformed				N	Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%				Mean	N-Mean
D-Control	0.7801	1.0000	0.7801	0.5493	0.9730	21.400	8			0.8513	1.0000
1250	0.7730	0.9909	0.7730	0.3466	1.1513	38.164	8	70.00	46.00	0.8513	1.0000
2500	0.9286	1.1903	0.9286	0.3466	1.0986	28.429	7	73.00	36.00	0.8513	1.0000
5000	0.9235	1.1838	0.9235	0.5493	1.0986	18.414	8	82.00	46.00	0.8513	1.0000
10000	0.4142	0.5309	0.4142	0.0000	0.6931	88.326	3	9.50	7.00	0.4142	0.4865

Auxiliary Tests

Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$)
Bartlett's Test indicates equal variances ($p = 0.38$)

Statistic	Critical	Skew	Kurt
0.89895	0.908	-0.9825	0.4407
4.19703	13.2767		

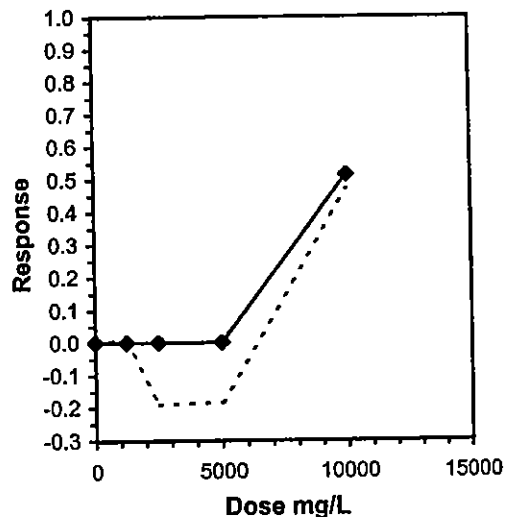
Hypothesis Test (1-tail, 0.05)

Wilcoxon Rank Sum Test NOEC LOEC ChV TU

10000 >10000

Linear Interpolation (200 Resamples)

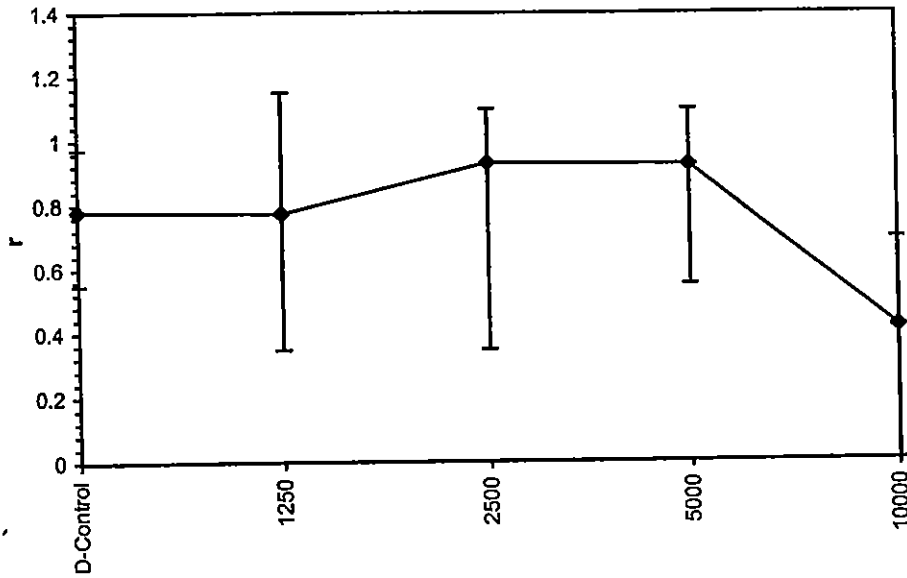
Point	mg/L	SD	95% CL(Exp)	Skew
IC05	5486.85	976.365	0 6449.75	-3.3442
IC10	5973.71	835.37	4696.72 7899.5	-1.7053
IC15	6460.56			
IC20	6947.41			
IC25	7434.26			
IC40	8894.82			
IC50	9868.53			



Rotifer Test-r

Start Date: 4/11/03	Test ID: 0304-23NW	Sample ID: Beazer
nd Date: 4/13/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: PSA-p-phenol sulfonic acid
Sample Date: 4/11/03	Protocol: ASTM E1440	Test Species: BC-Brachionus calyciflorus
Comments:		

Dose-Response Plot



Appendix D

Copper (II) Chloride Reference Toxicant Data

Ceriodaphnia dubia

Acute Exposure

Freshwater Acute

48 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Internal
 Sample ID: CuCl₂
 Contact: _____
 Test #: 021211CDRA

Start Date & Time: 12.11.02/1540
 End Date & Time: 12.13.02/1430
 Test Organism: C. dubia
 Test Protocol: EPA 93 Acute

Concentration <u>ug/L</u>	Rep	Number of Live Organisms			Dissolved Oxygen (mg/L)			pH (pH units)			Conductivity (µmhos-cm)			Temperature (°C)			Percent Survival
		0	24	48	0	24	48	0	24	48	0	24	48	0	24	48	
Lab Control	A	5	5	5	8.25	—	8.2	8.28	—	7.92	177	—	246	25.1	24.1	24.6	100
	B	5	5	5	7.5	—	7.4	7.4	—	—	—	—	—	—	—	—	100
	C	5	5	4	—	—	—	—	—	—	—	—	—	—	—	—	80
	D	5	5	5	—	—	—	—	—	—	—	—	—	—	—	—	100
3.125	A	5	5	5	7.6	—	8.2	8.27	—	8.11	197	—	219	25.2	24.1	24.6	100
	B	5	5	5	—	—	—	—	—	—	—	—	—	—	—	—	100
	C	5	5	5	—	—	—	—	—	—	—	—	—	—	—	—	100
	D	5	5	5	—	—	—	—	—	—	—	—	—	—	—	—	100
6.25	A	5	5	5	7.6	—	8.2	8.26	—	8.11	198	—	172	25.1	24.1	24.6	100
	B	5	5	5	—	—	—	—	—	—	—	—	—	—	—	—	100
	C	5	5	5	—	—	—	—	—	—	—	—	—	—	—	—	100
	D	5	5	5	—	—	—	—	—	—	—	—	—	—	—	—	100
Technician Initials		BR	DB	MO													

Animal Source: Internal Date Received: NA

Comments: 0 hrs: _____
 24 hrs: _____
 48 hrs: _____

QA Check: SP 1/14/03 Final Review: SP 1/14/03

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

Freshwater Acute

48 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Internal
 Sample ID: CuCl2
 Contact: _____
 Test #: 02/21/CDRA

Start Date & Time: 12.11.03 / 1540
 End Date & Time: 12-13.02 / 1420
 Test Organism: C. dubia
 Test Protocol: EPA 93 ACUTE

Concentration <u>ug/L</u>	Rep	Number of Live Organisms			Dissolved Oxygen (mg/L)			pH (pH units)			Conductivity (µmhos-cm)			Temperature (°C)			Percent Survival
		0	24	48	0	24	48	0	24	48	0	24	48	0	24	48	
<u>12.5</u>	A	5	5	5	7.4	—	8.1	8.27	—	8.13	199	—	210	25.1	24.1	24.6	100
	B	5	5	5													100
	C	5	5	5													100
	D	5	5	4													80
<u>25</u>	A	5	6	3	7.6	—	8.1	8.26	—	8.15	197	—	216	25.0	24.1	24.6	60
	B	5	5	2													40
	C	5	1	0													20
	D	5	1	0													0
<u>50</u>	A	5	0	—	7.6	—	8.3	8.25	—	8.01	196	—	193	24.8	24.1		0
	B	5	0	—													0
	C	5	0	—													0
	D	5	0	—													0
Technician Initials		BR	DB	MD													

Animal Source: InternalDate Received: NA

Comments: 0 hrs: _____
 24 hrs: _____
 48 hrs: _____

QA Check: af 1/14/03Final Review: af 1/14/03

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

Daphnia Acute Survival Bioassay-48 Hr Survival

Start Date: 12/11/2002 Test ID: 021211CDRA Sample ID: REF-Ref Toxicant
End Date: 12/13/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: CUCL-Copper chloride
Sample Date: Protocol: EPAA 93-EPA Acute Test Species: CD-Ceriodaphnia dubia
Comments:

Conc-ug/L	1	2	3	4
L-Lab Control	1.0000	1.0000	0.8000	1.0000
3.125	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	0.8000
25	0.6000	0.4000	0.2000	0.0000
50	0.0000	0.0000	0.0000	0.0000

Conc-ug/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N				
L-Lab Control	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4			1	20
3.125	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00	0	20
6.25	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00	0	20
12.5	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4	18.00	10.00	1	20
*25	0.3000	0.3158	0.5650	0.2255	0.8861	50.368	4	10.00	10.00	14	20
*50	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	4	10.00	10.00	20	20

Auxiliary Tests

Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$) Statistic 0.81693 Critical 0.884 Skew -0.4309 Kurt 3.87537

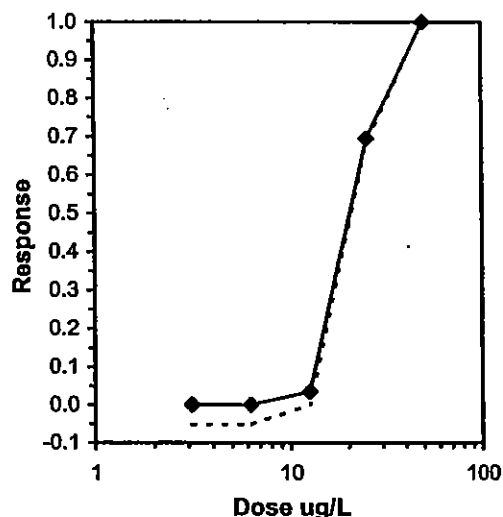
Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05) NOEC LOEC ChV TU

Steel's Many-One Rank Test 12.5 25 17.6777

Trimmed Spearman-Kärber

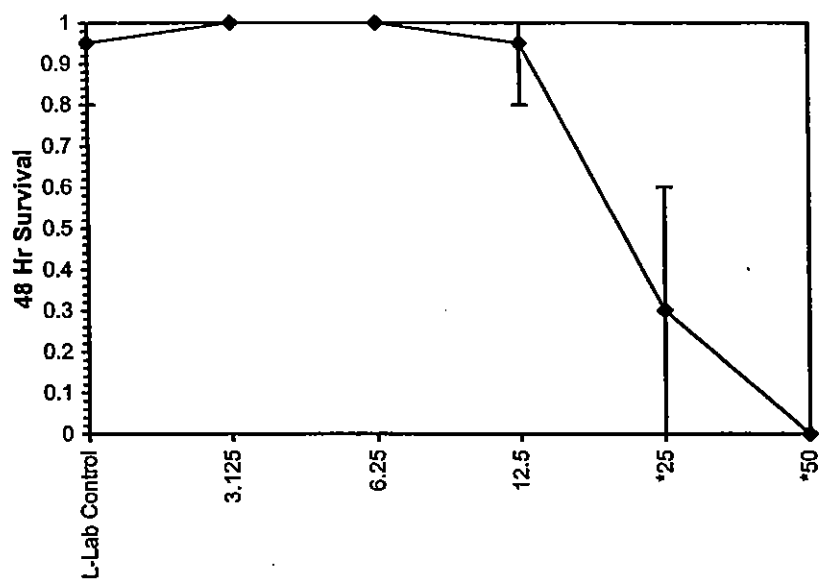
Trim Level	EC50	95% CL	
0.0%	21.333	18.300	24.869
5.0%	21.300	18.164	24.978
10.0%	21.045	17.718	24.996
20.0%	20.609	16.940	25.073
Auto-0.0%	21.333	18.300	24.869



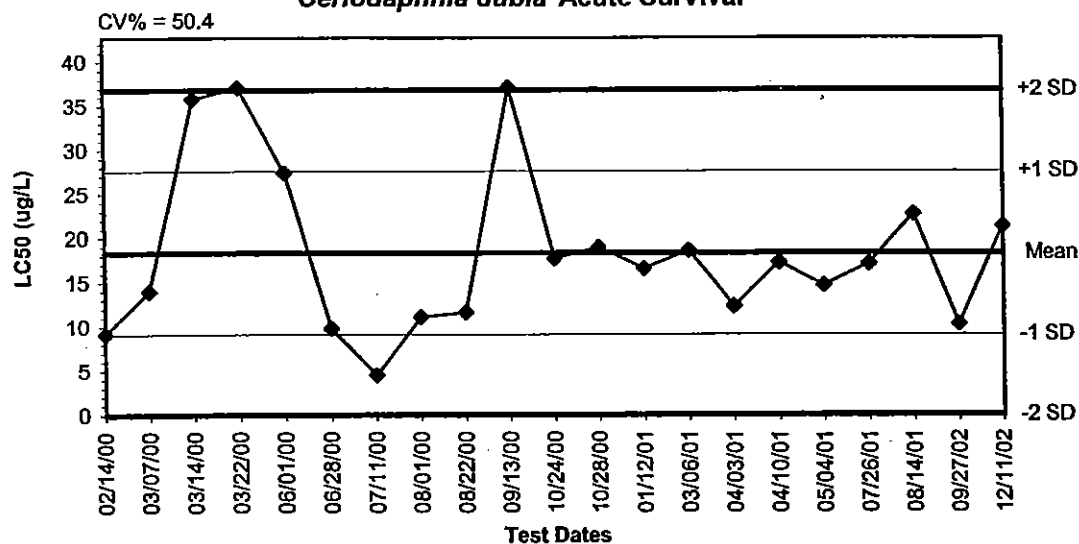
Daphnia Acute Survival Bioassay-48 Hr Survival

Start Date: 12/11/2002	Test ID: 021211CDRA	Sample ID:	REF-Ref Toxicant
End Date: 12/13/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	CUCL-Copper chloride
Sample Date:	Protocol: EPAA 93-EPA Acute	Test Species:	CD-Ceriodaphnia dubia
Comments:			

Dose-Response Plot



**Copper (II) Chloride Reference Toxicant Control Chart -
Ceriodaphnia dubia Acute Survival**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
02/14/00	9.1505	18.3302	9.0935	0.0000	27.5668	36.8034
03/07/00	13.9759	18.3302	9.0935	0.0000	27.5668	36.8034
03/14/00	35.7935	18.3302	9.0935	0.0000	27.5668	36.8034
03/22/00	37.0991	18.3302	9.0935	0.0000	27.5668	36.8034
06/01/00	27.3873	18.3302	9.0935	0.0000	27.5668	36.8034
06/28/00	9.8073	18.3302	9.0935	0.0000	27.5668	36.8034
07/11/00	4.5096	18.3302	9.0935	0.0000	27.5668	36.8034
08/01/00	11.0857	18.3302	9.0935	0.0000	27.5668	36.8034
08/22/00	11.5810	18.3302	9.0935	0.0000	27.5668	36.8034
09/13/00	37.0991	18.3302	9.0935	0.0000	27.5668	36.8034
10/24/00	17.6777	18.3302	9.0935	0.0000	27.5668	36.8034
10/28/00	18.9673	18.3302	9.0935	0.0000	27.5668	36.8034
01/12/01	16.5712	18.3302	9.0935	0.0000	27.5668	36.8034
03/06/01	18.5886	18.3302	9.0935	0.0000	27.5668	36.8034
04/03/01	12.3146	18.3302	9.0935	0.0000	27.5668	36.8034
04/10/01	17.2636	18.3302	9.0935	0.0000	27.5668	36.8034
05/04/01	14.6594	18.3302	9.0935	0.0000	27.5668	36.8034
07/26/01	17.1037	18.3302	9.0935	0.0000	27.5668	36.8034
08/14/01	22.7158	18.3302	9.0935	0.0000	27.5668	36.8034
09/27/02	10.2488	18.3302	9.0935	0.0000	27.5668	36.8034
12/11/02	21.3334	18.3302	9.0935	0.0000	27.5668	36.8034

Ceriodaphnia dubia

Chronic Exposure

Bioassay Laboratory
5550 Morehouse Dr., Suite B
San Diego, CA 92121

Client:

Internal

Sample ID:

CuCl₂

Initial Final em.
Seven Day Chronic Bioassay

Test Species:

C. dubia

Test Date/Time:

12.10.02 / 16K

Test No:

021210CDRT

Concentration	LC							
Day	0	1	2	3	4	5	6	7
pH	7.97	7.22	8.05	8.03	8.06	8.07	8.18	
DO (mg/L)	7.5	7.9	7.8	8.0	8.2	7.8	8.0	
Cond. (µmhos-cm)	199	197	204	200	199	197	193	
Temp (°C)	25.1	24.7	24.6	24.6	24.9	24.5	24.6	
pH		7.78	8.01	8.05	7.92	8.02	7.93	
DO (mg/L)		7.6	7.9	8.0	8.1	8.0	7.5	
Temp (°C)		24.2	24.1	24.6	24.2	24.5	24.7	24.8

Concentration	12.5 µg/l							
Day	0	1	2	3	4	5	6	7
pH	8.02	8.24	8.11	8.01	8.11	8.21	8.26	
DO (mg/L)	7.5	7.8	7.8	7.9	8.1	7.8	7.9	
Cond. (µmhos-cm)	199	198	195	190	198	195	195	
Temp (°C)	25.9	24.8	24.9	24.8	25.1	24.1	24.8	
pH		7.84	8.01	8.02	7.94	8.10	8.06	7.97
DO (mg/L)		7.6	8.0	7.9	8.0	8.1	8.1	7.6
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.8	24.8

Concentration	25 µg/l							
Day	0	1	2	3	4	5	6	7
pH	8.04	8.26	8.17	8.15	8.13	8.18	8.26	
DO (mg/L)	7.5	7.8	7.8	7.9	8.1	7.8	7.9	
Cond. (µmhos-cm)	197	197	196	196	198	198	196	
Temp (°C)	25.3	25.0	24.9	24.9	25.2	25.0	24.8	
pH		7.93	7.98	8.05	7.93	8.12	8.06	7.91
DO (mg/L)		7.5	7.8	7.9	8.0	8.2	8.1	7.6
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

Concentration	50 µg/l							
Day	0	1	2	3	4	5	6	7
pH	8.05	8.26	8.19	8.21	8.12	8.23	8.27	
DO (mg/L)	7.5	7.8	7.8	7.9	8.1	7.9	7.7	
Cond. (µmhos-cm)	196	198	198	193	198	199	197	
Temp (°C)	25.2	25.0	24.9	24.8	25.6	25.0	25.1	
pH		7.94	7.92	8.01	7.94	8.12	8.06	7.91
DO (mg/L)		7.5	7.6	7.9	8.0	8.2	8.1	7.6
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

Concentration	100 µg/l							
Day	0	1	2	3	4	5	6	7
pH	8.05	8.26	8.25	8.16	8.13	8.24	8.27	
DO (mg/L)	7.5	7.8	7.8	8.0	8.0	8.0	7.9	
Cond. (µmhos-cm)	195	197	195	195	200	198	197	
Temp (°C)	25.1	25.0	24.9	24.8	25.9	25.0	25.1	
pH		7.94	8.00	8.00	7.97	8.11	8.07	7.93
DO (mg/L)		7.5	7.8	7.9	8.1	8.2	8.2	7.7
Temp (°C)		24.2	24.1	24.6	24.2	24.3	24.5	24.8

Concentration	200 µg/l							
Day	0	1	2	3	4	5	6	7
pH	8.06	8.25	8.18	8.15				
DO (mg/L)	7.5	7.8	7.9	8.2				
Cond. (µmhos-cm)	194	195	193	199				
Temp (°C)	25.1	25.1	24.7	25.9				
pH		8.02						
DO (mg/L)		7.7						
Temp (°C)		24.2						

Comments:

Animal Source:

QA Check:

Internal

12/27/02

Analysts: MM

Date Received: NA

Final Review: 1/11/03

AMEC Earth and Environmental
Bioassay Laboratory
5550 Morehouse Dr., Suite B
San Diego, CA 92121

Daphnia Survival and Reproduction Datasheet

Client/Sample ID: Internal / C002
Test Number: 02/2100DPT

Start Date: 12.10.02
Start Time: 1615

End Date: 12/17/02
End Time: 1415

		Daily Reproduction/ Survival								Total	QA
Conc.	Rep	1	2	3	4	5	6	7	8		
LC	1	0	0	0	0	17	0	✓	—	25	24 RL
	2	0	0	5	0	10	16	✓	—	31	
	3	0	0	4	2	13	24	✓	—	43	
	4	0	0	16	12	0	14	✓	—	32	
	5	0	0	7	14	0	19	✓	—	40	
	6	0	0	5	18	0	13	✓	—	26	
	7	0	0	5	13	0	13	✓	—	31	
	8	0	0	0	7	14	16	✓	—	37	
	9	0	0	8	0	7	21	✓	—	46	
	10	0	0	0	7	11	14	✓	—	32	
Analyst	BR	BR	DG	AA	BR	DG	MW	DB			

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
50	1	0	0	0	0	12	19	✓	—	31	23 RL
	2	0	0	0	6	14	0	✓	—	42	
	3	0	0	0	7	16	0	✓	—	41	
	4	0	0	0	6	16	0	✓	—	44	
	5	0	0	0	6	14	0	✓	—	44	
	6	0	0	0	6	12	0	✓	—	34	
	7	0	0	0	7	12	20	✓	—	39	
	8	0	0	0	6	14	0	✓	—	30	
	9	0	0	0	6	13	0	✓	—	40	
	10	0	0	0	7	0	16	✓	—	46	

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
125	1	0	0	0	0	13	23	✓	—	44	22 RL
	2	0	0	0	12	0	19	✓	—	31	
	3	0	0	0	14	0	22	✓	—	42	
	4	0	0	0	13	0	20	✓	—	40	
	5	0	0	0	11	1	20	✓	—	32	
	6	0	0	0	6	12	25	✓	—	43	
	7	0	0	0	9	0	13	✓	—	28	
	8	0	0	0	5	10	19	✓	—	34	
	9	0	0	0	15	0	20	✓	—	43	
	10	0	0	0	6	15	0	✓	—	40	

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
100	1	0	0	0	5	13	15	—	—	33	3 RL
	2	0	0	0	2	0	0	—	—	2	
	3	0	0	0	19	0	0	—	—	19	
	4	0	0	0	6	7	0	—	—	13	
	5	0	0	0	1	—	—	—	—	1	
	6	0	0	0	3	4	0	—	—	7	
	7	0	0	0	0	—	—	—	—	0	
	8	0	0	0	6	13	0	—	—	19	
	9	0	0	0	7	15	0	—	—	22	
	10	0	0	0	6	10	0	—	—	16	

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
25	1	0	0	0	7	13	23	✓	—	43	20 RL
	2	0	0	0	6	13	23	✓	—	41	
	3	0	0	0	12	0	17	✓	—	29	
	4	0	0	0	10	0	20	✓	—	30	
	5	0	0	0	7	14	20	✓	—	41	
	6	0	0	0	5	10	16	✓	—	31	
	7	0	0	0	6	0	17	✓	—	23	
	8	0	0	0	7	18	0	✓	—	25	
	9	0	0	0	5	14	0	✓	—	19	
	10	0	0	0	6	13	0	✓	—	19	

Conc.	Rep	Daily Reproduction/ Survival								Total	QA
		1	2	3	4	5	6	7	8		
200	1	0/d	—	—	—	—	—	—	—	0/d	0/d
	2	0	0	0/d	—	—	—	—	—	0/d	
	3	0	0	0/d	—	—	—	—	—	0/d	
	4	0/d	—	—	—	—	—	—	—	0/d	
	5	0/d	—	—	—	—	—	—	—	0/d	
	6	0/d	—	—	—	—	—	—	—	0/d	
	7	0/d	—	—	—	—	—	—	—	0/d	
	8	0/d	—	—	—	—	—	—	—	0/d	
	9	0/d	—	—	—	—	—	—	—	0/d	
	10	0/d	—	—	—	—	—	—	—	0/d	

Time Fed (day): (0) 1615 (1) 1600 (2) 1015 (3) 020 (4) 1400 (5) 1140 (6) 1150 (7) _____ (8) _____

Comments: _____

Reviewed: 11/14/02

QA checked: 12/27/02

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date: 12/10/2002 Test ID: 021210CDRT Sample ID: REF-Ref Toxicant
 End Date: 12/17/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: CUCL-Copper chloride
 Sample Date: Protocol: EPAF 94-EPA Freshwater Ct Test Species: CD-Ceriodaphnia dubia
 Comments:

Conc-ug/L	1	2	3	4	5	6	7	8	9	10
L-Lab Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	1.0000	1.0000
200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-ug/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
L-Lab Control	1.0000	1.0000	0	10	10	10			0	10
12.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
25	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
50	0.9000	0.9000	1	9	10	10	0.5000	0.0500	1	10
*100	0.3000	0.3000	7	3	10	10	0.0015	0.0500	7	10
*200	0.0000	0.0000	10	0	10	10	0.0000	0.0500	10	10

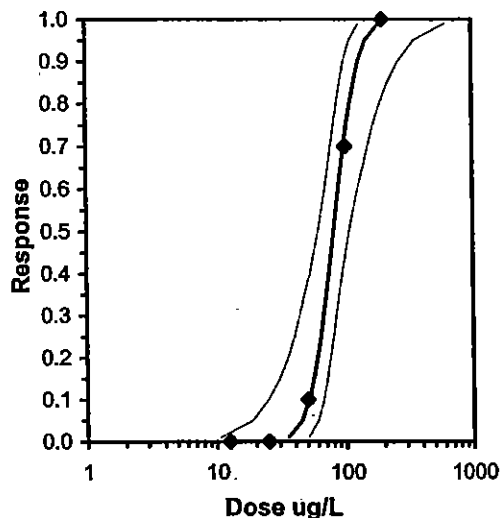
Hypothesis Test (1-tail, 0.05) **NOEC** **LOEC** **ChV** **TU**
 Fisher's Exact Test 50 100 70.7107

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits	Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	6.41183	1.89248	2.70258 10.1211	0	0.10081	7.81472	0.99	1.90847	0.15596	4
Intercept	-7.2368	3.62549	-14.343 -0.1308							

TSCR

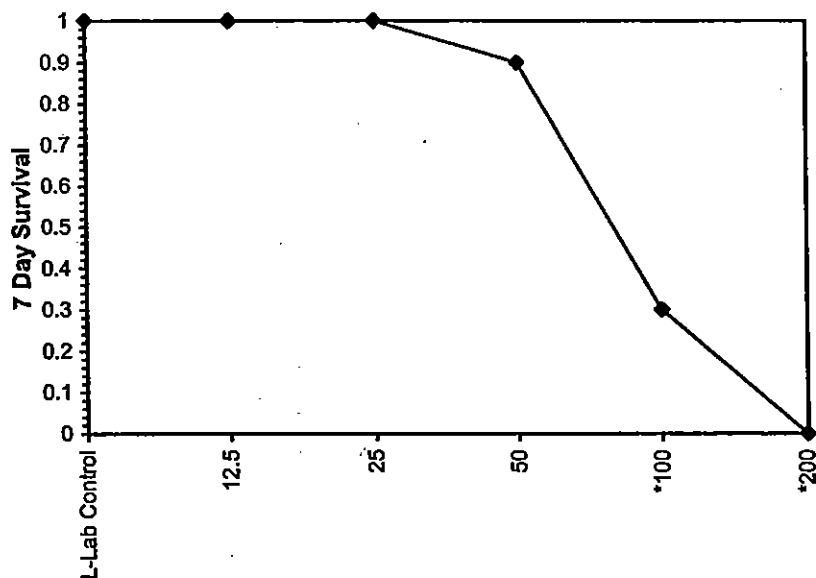
Point	Probits	ug/L	95% Fiducial Limits
EC01	2.674	35.1278	10.6035 50.2789
EC05	3.355	44.8682	18.5832 59.8706
EC10	3.718	51.121	24.8952 66.1517
EC15	3.964	55.825	30.1809 71.0953
EC20	4.158	59.8703	35.0253 75.6002
EC25	4.326	63.5737	39.6345 80.0178
EC40	4.747	73.9537	52.7601 94.7097
EC50	5.000	80.9976	61.1361 107.443
EC60	5.253	88.7125	69.3158 124.571
EC75	5.674	103.197	81.986 165.939
EC80	5.842	109.58	86.7615 187.809
EC85	6.036	117.521	92.245 217.988
EC90	6.282	128.335	99.1254 264.306
EC95	6.645	146.22	109.511 354.126
EC99	7.326	186.764	130.387 620.697



Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date: 12/10/2002 Test ID: 021210CDRT Sample ID: REF-Ref Toxicant
End Date: 12/17/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: CUCL-Copper chloride
Sample Date: Protocol: EPAF 94-EPA Freshwater Ct Test Species: CD-Ceriodaphnia dubia
Comments:

Dose-Response Plot



Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 12/10/2002 Test ID: 021210CDRT Sample ID: REF-Ref Toxicant
 End Date: 12/17/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: CUCL-Copper chloride
 Sample Date: Protocol: EPAF 94-EPA Freshwater Cf Test Species: CD-Ceriodaphnia dubia
 Comments:

Conc-ug/L	1	2	3	4	5	6	7	8	9	10
-Lab Control	25.000	31.000	43.000	32.000	40.000	36.000	31.000	37.000	46.000	32.000
12.5	44.000	39.000	42.000	40.000	39.000	43.000	28.000	34.000	43.000	40.000
25	43.000	41.000	34.000	36.000	41.000	36.000	33.000	41.000	38.000	39.000
50	37.000	42.000	41.000	44.000	44.000	34.000	39.000	39.000	40.000	46.000
100	33.000	9.000	28.000	29.000	1.000	10.000	0.000	36.000	37.000	30.000
200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Conc-ug/L	Transform: Untransformed							Rank Sum	1-Tailed Critical	Mean	N-Mean
	Mean	N-Mean	Mean	Min	Max	CV%	N				
-Lab Control	35.300	1.0000	35.300	25.000	46.000	18.018	10			35.300	0.0000
12.5	39.200	1.1105	39.200	28.000	44.000	12.428	10	124.00	75.00	39.200	-0.1105
25	38.200	1.0822	38.200	33.000	43.000	8.796	10	122.50	75.00	38.200	-0.0822
50	40.600	1.1501	40.600	34.000	46.000	8.858	10	131.50	75.00	40.600	-0.1501
*100	21.300	0.6034	21.300	0.000	37.000	68.646	10	75.00	75.00	21.300	0.3966
*200	0.000	0.0000	0.000	0.000	0.000	0.000	10	55.00	75.00	0.000	1.0000

Auxiliary Tests

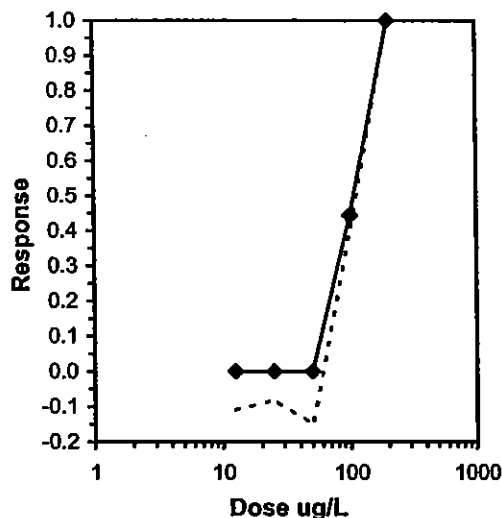
Kolmogorov D Test indicates non-normal distribution ($p \leq 0.01$) Statistic: 1.21543 Critical: 1.035 Skew: -0.6872 Kurt: 2.17512
 Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)

Steel's Many-One Rank Test NOEC: 50 LOEC: 100 ChV: 70.7107 TU:

Trimmed Spearman-Kärber

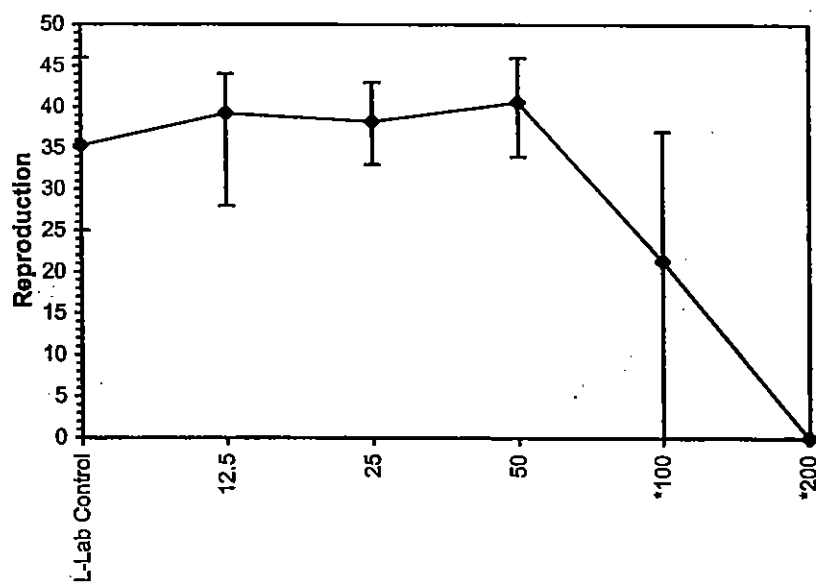
Trim Level	EC50	95% CL
0.0%	103.94	83.60 129.24
5.0%	104.34	81.87 132.99
10.0%	104.75	79.58 137.87
20.0%	105.55	72.45 153.78
Auto-0.0%	103.94	83.60 129.24



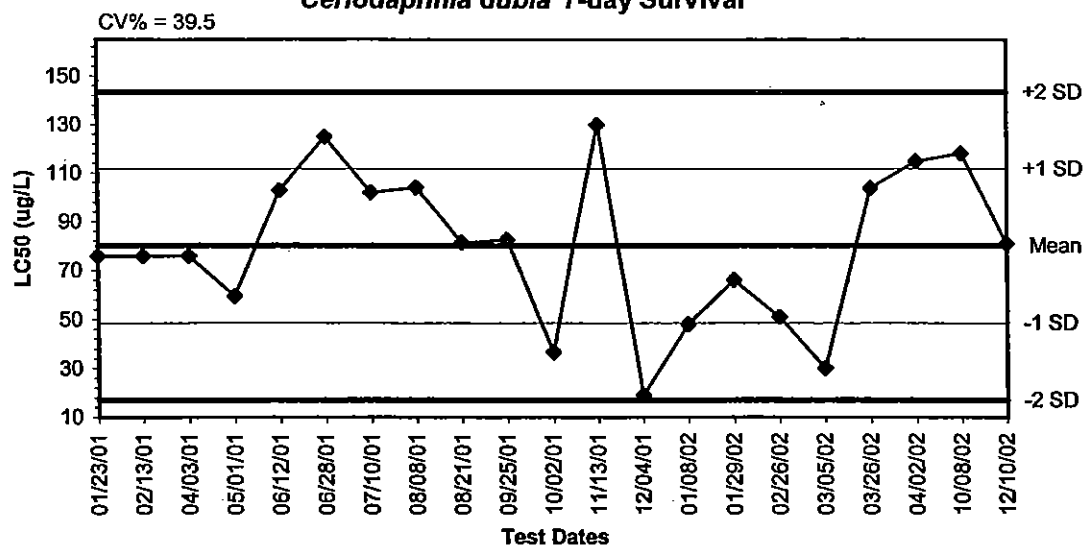
Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 12/10/2002	Test ID: 021210CDRT	Sample ID: REF-Ref Toxicant
End Date: 12/17/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: CUCL-Copper chloride
Sample Date:	Protocol: EPAF 94-EPA Freshwater Cf	Test Species: CD-Ceriodaphnia dubia
Comments:		

Dose-Response Plot

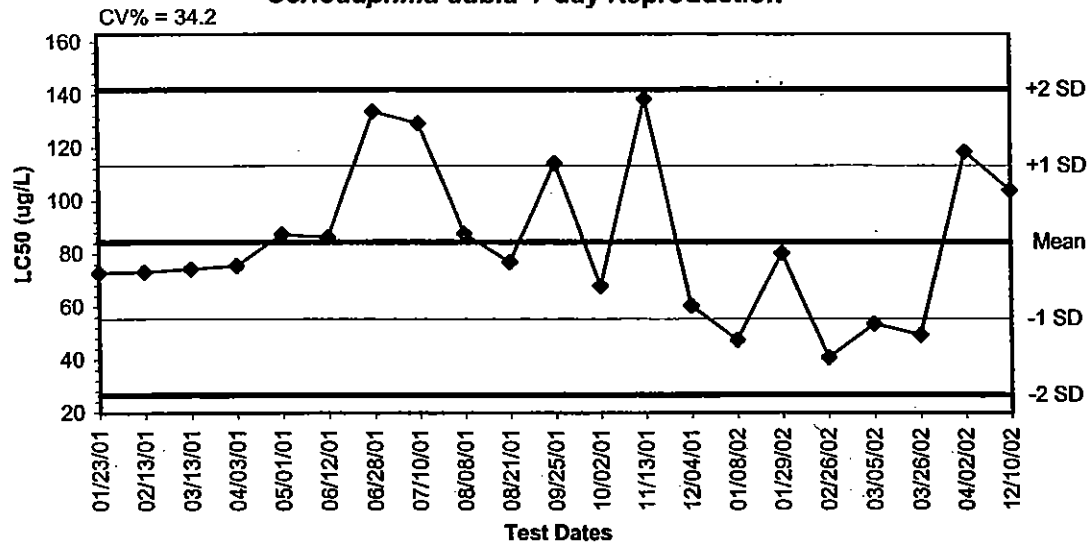


**Copper (II) Chloride Reference Toxicant Control Chart -
Ceriodaphnia dubia 7-day Survival**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
01/23/01	75.7858	80.0650	48.4725	16.8799	111.6575	143.2500
02/13/01	75.7858	80.0650	48.4725	16.8799	111.6575	143.2500
04/03/01	75.7858	80.0650	48.4725	16.8799	111.6575	143.2500
05/01/01	59.3503	80.0650	48.4725	16.8799	111.6575	143.2500
06/12/01	102.8499	80.0650	48.4725	16.8799	111.6575	143.2500
06/28/01	124.8774	80.0650	48.4725	16.8799	111.6575	143.2500
07/10/01	101.8408	80.0650	48.4725	16.8799	111.6575	143.2500
08/08/01	103.9259	80.0650	48.4725	16.8799	111.6575	143.2500
08/21/01	81.2252	80.0650	48.4725	16.8799	111.6575	143.2500
09/25/01	82.3422	80.0650	48.4725	16.8799	111.6575	143.2500
10/02/01	36.5766	80.0650	48.4725	16.8799	111.6575	143.2500
11/13/01	129.6840	80.0650	48.4725	16.8799	111.6575	143.2500
12/04/01	18.9299	80.0650	48.4725	16.8799	111.6575	143.2500
01/08/02	47.8575	80.0650	48.4725	16.8799	111.6575	143.2500
01/29/02	65.9028	80.0650	48.4725	16.8799	111.6575	143.2500
02/26/02	50.9438	80.0650	48.4725	16.8799	111.6575	143.2500
03/05/02	30.0123	80.0650	48.4725	16.8799	111.6575	143.2500
03/26/02	103.7274	80.0650	48.4725	16.8799	111.6575	143.2500
04/02/02	114.8698	80.0650	48.4725	16.8799	111.6575	143.2500
10/08/02	118.0938	80.0650	48.4725	16.8799	111.6575	143.2500
12/10/02	80.9976	80.0650	48.4725	16.8799	111.6575	143.2500

**Copper (II) Chloride Reference Toxicant Control Chart -
Ceriodaphnia dubia 7-day Reproduction**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
01/23/01	72.7564	84.3264	55.5010	26.6755	113.1518	141.9773
02/13/01	73.2301	84.3264	55.5010	26.6755	113.1518	141.9773
03/13/01	74.2706	84.3264	55.5010	26.6755	113.1518	141.9773
04/03/01	75.5240	84.3264	55.5010	26.6755	113.1518	141.9773
05/01/01	87.2951	84.3264	55.5010	26.6755	113.1518	141.9773
06/12/01	86.0807	84.3264	55.5010	26.6755	113.1518	141.9773
06/28/01	133.7090	84.3264	55.5010	26.6755	113.1518	141.9773
07/10/01	129.1806	84.3264	55.5010	26.6755	113.1518	141.9773
08/08/01	87.5478	84.3264	55.5010	26.6755	113.1518	141.9773
08/21/01	76.9022	84.3264	55.5010	26.6755	113.1518	141.9773
09/25/01	114.1681	84.3264	55.5010	26.6755	113.1518	141.9773
10/02/01	67.9029	84.3264	55.5010	26.6755	113.1518	141.9773
11/13/01	138.4422	84.3264	55.5010	26.6755	113.1518	141.9773
12/04/01	60.4050	84.3264	55.5010	26.6755	113.1518	141.9773
01/08/02	47.3164	84.3264	55.5010	26.6755	113.1518	141.9773
01/29/02	80.1282	84.3264	55.5010	26.6755	113.1518	141.9773
02/26/02	40.7986	84.3264	55.5010	26.6755	113.1518	141.9773
03/05/02	53.5714	84.3264	55.5010	26.6755	113.1518	141.9773
03/26/02	49.3421	84.3264	55.5010	26.6755	113.1518	141.9773
04/02/02	118.3415	84.3264	55.5010	26.6755	113.1518	141.9773
12/10/02	103.9416	84.3264	55.5010	26.6755	113.1518	141.9773

Pimephales promelas

Freshwater 96-hr Acute with Renewal

96 Hour Toxicity Test Data Sheet - AMEC Bioassay Laboratory

Client: Internal
 Sample ID: CuCl2
 Contact: _____
 Test #: B21211PPRA

Start Date & Time: 12/11/02 1700
 End Date & Time: 12/19/02
 Test Organism: P. promelas
 Test Protocol: EPA 93 Acute

Concentration <u>mg/L</u>	Rep	Number of Live Organisms					D.O. (mg/L)					pH (pH units)					Conductivity (µmhos-cm)				Test Temperature (°C)						% Surv.		
							Init. Fin.					Init. Fin.					Init. Fin.		Init. Fin.		Init. Fin.								
		0	24	48	72	96	0	24	48	48	72	96	0	24	48	48	72	96	0	48	48	96	0	24	48	48		72	96
Lab Control	A	10	9	9	9	9	7.5	8.2	8.0	8.2	8.1	8.1	8.10	8.14	7.73	8.02	8.0	8.1	199	202	220	210	19.4	20.5	19.5	20.1	19.8	20.0	90
	B	10	10	10	10	10													173										100
15	A	10	10	10	9	8	7.5	8.3	8.0	8.4	8.1	8.1	8.11	8.09	7.93	8.05	8.00	8.13	198	177	198	190	19.4	20.5	20.0	20.1	19.7	20.0	80
	B	10	10	10	9	8																							80
30	A	10	9	7	6	6	7.6	8.1	8.0	8.4	8.3	8.1	8.16	8.12	8.04	8.04	8.01	8.11	197	174	197	186	19.4	20.5	20.0	20.1	19.6	20.0	60
	B	10	10	10	9	9																							90
60	A	10	6	5	4	4	7.6	8.0	8.0	8.4	8.5	8.3	8.15	8.19	8.10	8.03	8.05	8.16	197	172	194	188	19.4	20.5	20.0	20.1	19.6	20.0	40
	B	10	8	8	7	6																							60
120	A	10	3	3	2	1	7.6	8.2	8.0	8.5	8.5	8.4	8.16	8.26	8.12	8.07	8.06	8.15	196	169	197	188	19.4	20.6	20.0	20.1	19.5	20.0	10
	B	10	3	3	2	2																							20
240	A	10	2	1	1	1	7.6	8.4	8.0	8.4	8.7	8.5	8.15	8.02	8.11	8.07	8.08	8.16	194	168	199	186	19.4	20.6	19.3	20.1	19.6	20.0	10
	B	10	1	1	1	1																							10
	A																												
	B																												
Technician Initials		AK	26	AK	AK	DB																							

Animal Source: ABS Date Received: 12/6/02

Comments: 0 hrs: 14 days old @ initiation
 24 hrs: _____
 48 hrs: Fed 0845
 72 hrs: _____
 96 hrs: _____

QA Check: af 1/14/03 Final Review: af 1/14/03

AMEC Earth and Environmental
 5550 Morehouse Dr., Suite B
 San Diego, CA 92121
 (858) 458-9044

Acute Fish Test-96 Hr Survival

Start Date: 12/11/2002	Test ID: 021211PPRA	Sample ID:	REF-Ref Toxicant
End Date: 12/15/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	CUCL-Copper chloride
Sample Date:	Protocol: EPAA 93-EPA Acute	Test Species:	PP-Pimephales promelas
Comments:			

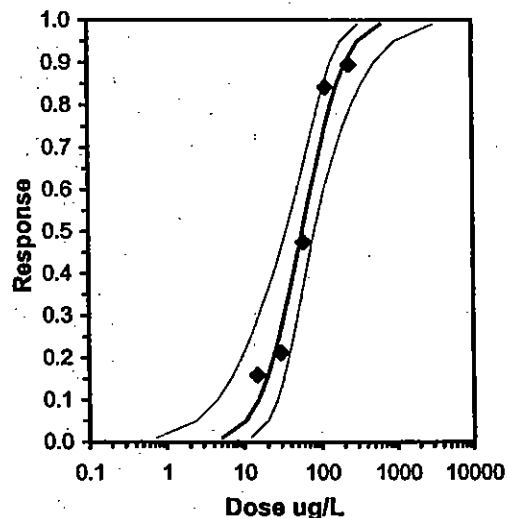
Conc-ug/L	1	2
L-Lab Control	0.9000	1.0000
15	0.8000	0.8000
30	0.6000	0.9000
60	0.4000	0.6000
120	0.1000	0.2000
240	0.1000	0.1000

Transform: Arcsin Square Root								Number	Total
Conc-ug/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Resp	Number
L-Lab Control	0.9500	1.0000	1.3305	1.2490	1.4120	8.661	2	1	20
15	0.8000	0.8421	1.1071	1.1071	1.1071	0.000	2	4	20
30	0.7500	0.7895	1.0676	0.8861	1.2490	24.041	2	5	20
60	0.5000	0.5263	0.7854	0.6847	0.8861	18.129	2	10	20
120	0.1500	0.1579	0.3927	0.3218	0.4636	25.550	2	17	20
240	0.1000	0.1053	0.3218	0.3218	0.3218	0.000	2	18	20

Auxillary Tests

Normality of the data set cannot be confirmed
Equality of variance cannot be confirmed

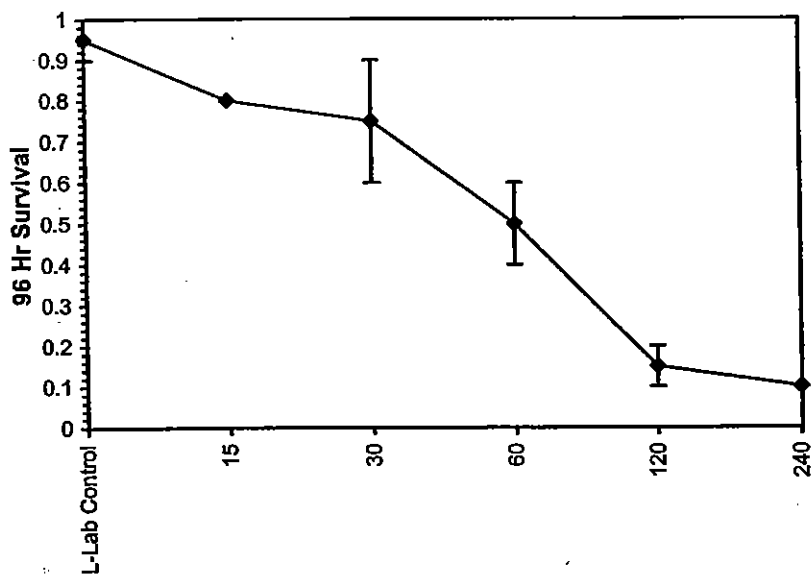
Maximum Likelihood-Probit												
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter	
Slope	2.22138	0.47037	1.29946	3.14331	0.05	1.63108	7.81472	0.65	1.7606	0.45017	5	
Intercept	1.08902	0.87069	-0.6175	2.79557								
TSCR	0.05837	0.05097	-0.0415	0.15828								
Point	Probits	ug/L	95% Fiducial Limits									
EC01	2.674	5.16835	0.72391	12.0499								
EC05	3.355	10.4747	2.3755	20.2379								
EC10	3.718	15.2647	4.44875	26.8437								
EC15	3.964	19.6803	6.76449	32.618								
EC20	4.158	24.0841	9.40285	38.2233								
EC25	4.326	28.6397	12.4261	43.9583								
EC40	4.747	44.3154	24.4501	64.1454								
EC50	5.000	57.624	35.6438	82.99								
EC60	5.253	74.9295	50.117	111.324								
EC75	5.674	115.941	80.5849	198.789								
EC80	5.842	137.872	94.8217	256.758								
EC85	6.036	168.723	113.238	350.217								
EC90	6.282	217.53	139.791	524.156								
EC95	6.645	317.006	188.031	967.989								
EC99	7.326	642.474	319.754	3137.16								



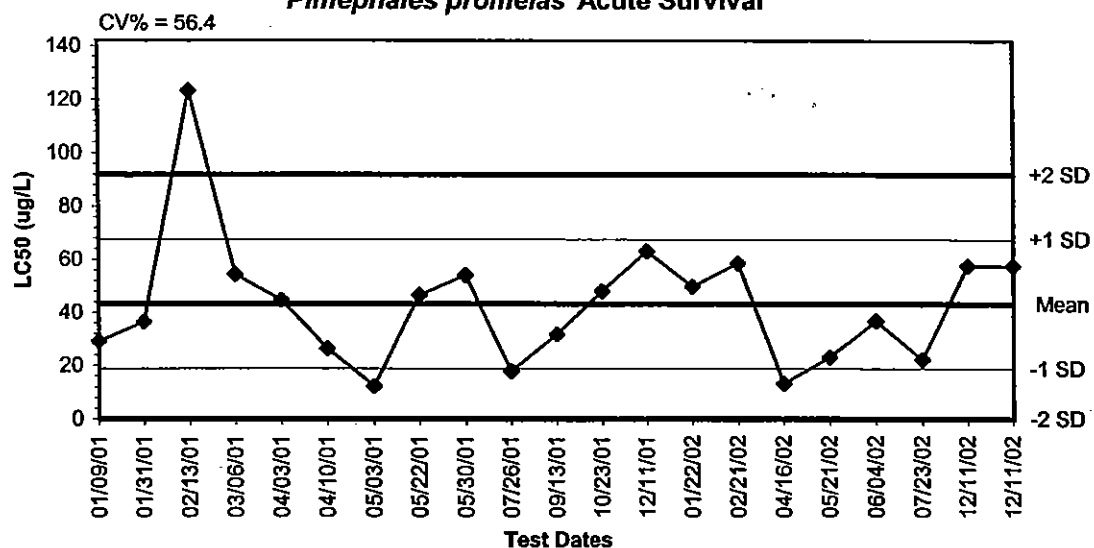
Acute Fish Test-96 Hr Survival

Start Date: 12/11/2002	Test ID: 021211PPRA	Sample ID: REF-Ref Toxicant
End Date: 12/15/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: CUCL-Copper chloride
Sample Date:	Protocol: EPAA 93-EPA Acute	Test Species: PP-Pimephales promelas
Comments:		

Dose-Response Plot



**Copper (II) Chloride Reference Toxicant Control Chart -
Pimephales promelas Acute Survival**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
01/09/01	29.1004	43.1834	18.8432	0.0000	67.5235	91.8636
01/31/01	36.4195	43.1834	18.8432	0.0000	67.5235	91.8636
02/13/01	123.3779	43.1834	18.8432	0.0000	67.5235	91.8636
03/06/01	54.4075	43.1834	18.8432	0.0000	67.5235	91.8636
04/03/01	44.7056	43.1834	18.8432	0.0000	67.5235	91.8636
04/10/01	26.3860	43.1834	18.8432	0.0000	67.5235	91.8636
05/03/01	12.2396	43.1834	18.8432	0.0000	67.5235	91.8636
05/22/01	46.5890	43.1834	18.8432	0.0000	67.5235	91.8636
05/30/01	54.0560	43.1834	18.8432	0.0000	67.5235	91.8636
07/26/01	17.8228	43.1834	18.8432	0.0000	67.5235	91.8636
09/13/01	31.7269	43.1834	18.8432	0.0000	67.5235	91.8636
10/23/01	48.0259	43.1834	18.8432	0.0000	67.5235	91.8636
12/11/01	63.1292	43.1834	18.8432	0.0000	67.5235	91.8636
01/22/02	49.7598	43.1834	18.8432	0.0000	67.5235	91.8636
02/21/02	58.5418	43.1834	18.8432	0.0000	67.5235	91.8636
04/16/02	13.1365	43.1834	18.8432	0.0000	67.5235	91.8636
05/21/02	23.1358	43.1834	18.8432	0.0000	67.5235	91.8636
06/04/02	36.7981	43.1834	18.8432	0.0000	67.5235	91.8636
07/23/02	22.2447	43.1834	18.8432	0.0000	67.5235	91.8636
12/11/02	57.6240	43.1834	18.8432	0.0000	67.5235	91.8636
12/11/02	57.6240	43.1834	18.8432	0.0000	67.5235	91.8636

Hyaella azteca

96-hr Freshwater Sediment Survival and Chemistry Results

AMEC Bioassay Laboratory

Client: Internal (Sauget #4)

Site ID: CuCl2

Analysts: JR

Test Organism: H. azteca

Start Date/Time: 12/13/2002

End Date/Time: 12.17.02 / 1540

Conc./ Site mg/L	Rep	Survival		Dissolved O ₂ (mg/L)					pH (pH units)					Cond. (umhos/cm)					Temperature (°C)				
		0	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
Cont.	A	10	10	8.4	8.6	8.6	8.1	8.5	7.76	7.86	7.85	7.81	7.24	834	836	825	863	862	20.4	20.2	20.1	21.0	20.1
	B	10	10																				
	C	10	10																				
	D	10	10																				
0.1975	A	10	8	8.6	8.8	8.5	8.2	8.2	7.77	7.89	7.88	7.76	8.18	831	827	826	854	831	20.3	20.2	20.1	21.0	20.2
	B	10	9																				
	C	10	9																				
	D	10	10																				
0.375	A	10	10	8.6	8.5	8.4	8.3	8.1	7.80	7.91	7.89	7.91	8.09	830	826	825	853	828	20.3	20.1	20.1	21.0	21.2
	B	10	9																				
	C	10	7																				
	D	10	9																				
0.75	A	10	7	8.6	8.6	8.5	8.3	8.2	7.76	7.91	7.90	7.93	8.08	827	824	823	849	826	20.1	20.1	20.1	21.0	20.7
	B	10	8																				
	C	10	5																				
	D	10	10																				
1.5	A	10	5	8.6	8.6	8.5	8.5	8.3	7.71	7.85	7.90	7.93	8.06	821	819	817	846	821	20.1	20.1	20.1	21.0	20.3
	B	10	3																				
	C	10	3																				
	D	10	5																				
3.0	A	10	0	8.6	8.6	8.5	8.5	8.2	7.57	7.74	7.82	7.91	8.03	812	809	809	854	824	20.3	20.1	20.1	21.0	20.1
	B	10	2																				
	C	10	2																				
	D	10	2																				

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

QA Check: 1/9/03 AH

Final Review: [Signature] 1/14/03

Amphipod 96-Hr Survival Bioassay-96 Hr Survival

Start Date: 12/13/2002	Test ID: 021213HARA	Sample ID: REF-Ref Toxicant
End Date: 12/17/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: CUCL-Copper chloride
Sample Date:	Protocol: ASTM 93	Test Species: HA-Hyalella azteca
Comments:		

Conc-ug/L	1	2	3	4
L-Lab Control	1.0000	1.0000	1.0000	1.0000
197.5	0.8000	0.9000	0.9000	1.0000
375	1.0000	0.9000	0.7000	0.9000
750	0.7000	0.8000	0.5000	1.0000
1500	0.5000	0.3000	0.3000	0.5000
3000	0.0000	0.2000	0.2000	0.2000

Conc-ug/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N				
L-Lab Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
197.5	0.9000	0.9000	1.2543	1.1071	1.4120	9.935	4	12.00	10.00	4	40
375	0.8750	0.8750	1.2253	0.9912	1.4120	14.199	4	12.00	10.00	5	40
750	0.7500	0.7500	1.0739	0.7854	1.4120	24.371	4	12.00	10.00	10	40
*1500	0.4000	0.4000	0.6825	0.5796	0.7854	17.405	4	10.00	10.00	24	40
*3000	0.1500	0.1500	0.3874	0.1588	0.4636	39.345	4	10.00	10.00	34	40

Auxiliary Tests

Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$) 0.96151 0.884 -0.0359 0.69755

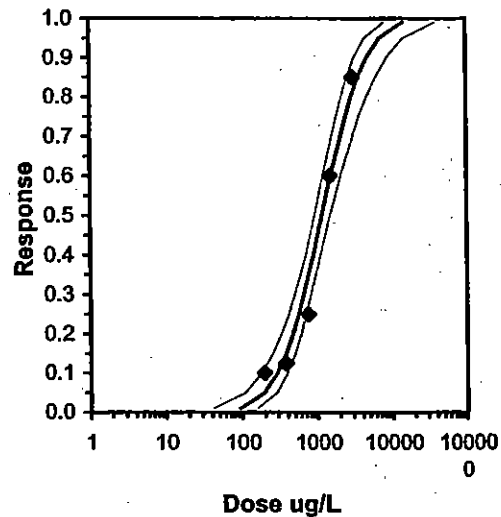
Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05) **NOEC** **LOEC** **ChV** **TU**

Steel's Many-One Rank Test 750 1500 1060.66

Parameter	Value	SE	95% Fiducial Limits		Maximum Likelihood-Probit						
					Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	2.11993	0.27723	1.57656	2.6633	0	4.12896	7.81472	0.25	3.0666	0.47171	3
Intercept	-1.501	0.82917	-3.1261	0.12419							

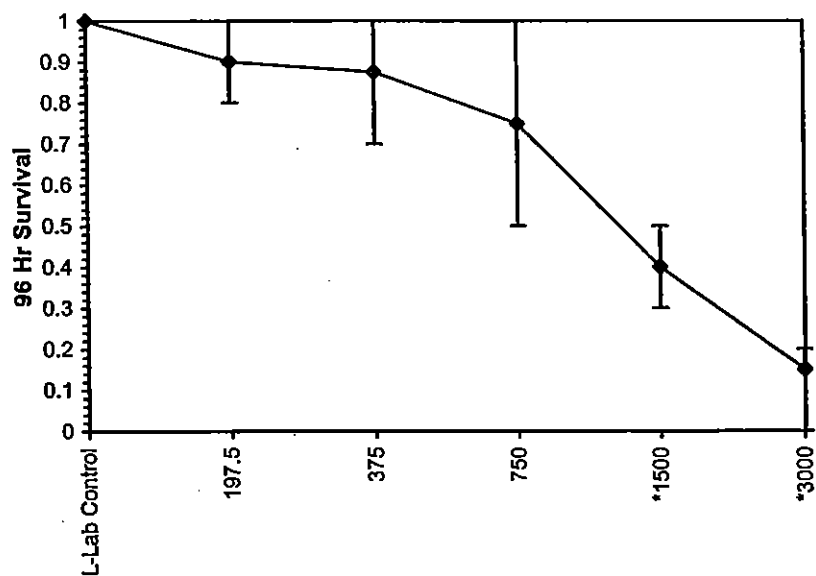
Point	Probits	ug/L	95% Fiducial Limits	
EC01	2.674	93.1603	40.5418	154.93
EC05	3.355	195.299	107.853	284.024
EC10	3.718	289.785	180.449	395.077
EC15	3.964	378.182	253.984	496.298
EC20	4.158	467.301	331.561	597.997
EC25	4.326	560.318	414.528	705.461
EC40	4.747	885.306	702.966	1107.51
EC50	5.000	1165.74	936.148	1498.85
EC60	5.253	1535	1219.38	2073.88
EC75	5.674	2425.31	1832.72	3673.52
EC80	5.842	2908.07	2140.41	4639.22
EC85	6.036	3593.36	2557.76	6106.58
EC90	6.282	4689.49	3190.93	8654.69
EC95	6.645	6958.26	4411.53	14569
EC99	7.326	14587.2	8043.44	38969.6



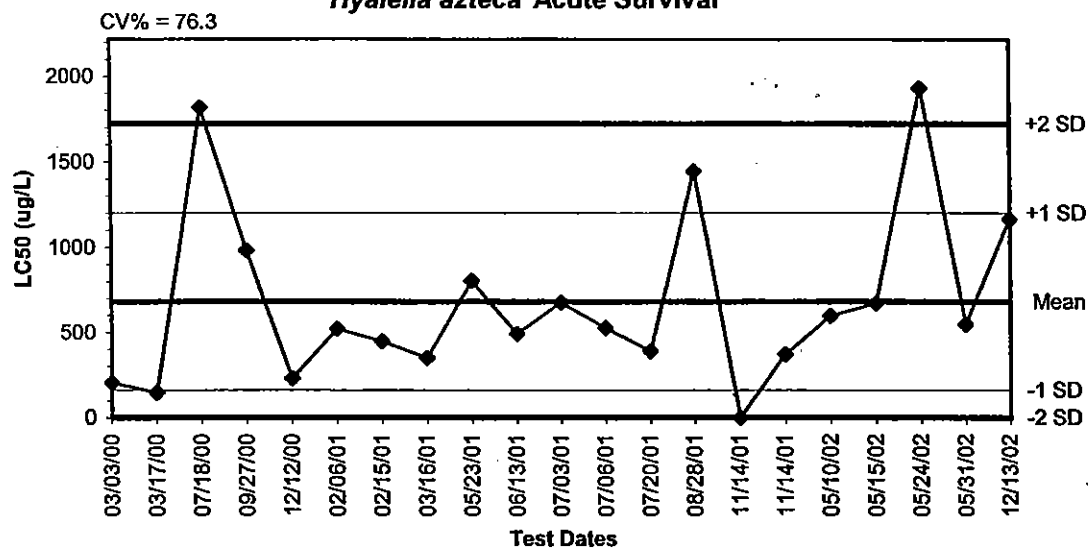
Amphipod 96-Hr Survival Bioassay-96 Hr Survival

Start Date: 12/13/2002	Test ID: 021213HARA	Sample ID: REF-Ref Toxicant
End Date: 12/17/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: CUCL-Copper chloride
Sample Date:	Protocol: ASTM 93	Test Species: HA-Hyalella azteca
Comments:		

Dose-Response Plot



**Copper (II) Chloride Reference Toxicant Control Chart -
Hyalella azteca Acute Survival**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
03/03/00	203.5576	681.5309	161.3517	0.0000	1201.7101	1721.8893
03/17/00	146.8149	681.5309	161.3517	0.0000	1201.7101	1721.8893
07/18/00	1817.5541	681.5309	161.3517	0.0000	1201.7101	1721.8893
09/27/00	982.3056	681.5309	161.3517	0.0000	1201.7101	1721.8893
12/12/00	230.2174	681.5309	161.3517	0.0000	1201.7101	1721.8893
02/06/01	519.8706	681.5309	161.3517	0.0000	1201.7101	1721.8893
02/15/01	447.9034	681.5309	161.3517	0.0000	1201.7101	1721.8893
03/16/01	350.8374	681.5309	161.3517	0.0000	1201.7101	1721.8893
05/23/01	803.5751	681.5309	161.3517	0.0000	1201.7101	1721.8893
06/13/01	491.3767	681.5309	161.3517	0.0000	1201.7101	1721.8893
07/03/01	676.3369	681.5309	161.3517	0.0000	1201.7101	1721.8893
07/06/01	526.2626	681.5309	161.3517	0.0000	1201.7101	1721.8893
07/20/01	389.7241	681.5309	161.3517	0.0000	1201.7101	1721.8893
08/28/01	1444.6654	681.5309	161.3517	0.0000	1201.7101	1721.8893
11/14/01	0.3712	681.5309	161.3517	0.0000	1201.7101	1721.8893
11/14/01	371.1761	681.5309	161.3517	0.0000	1201.7101	1721.8893
05/10/02	597.1113	681.5309	161.3517	0.0000	1201.7101	1721.8893
05/15/02	670.4742	681.5309	161.3517	0.0000	1201.7101	1721.8893
05/24/02	1930.3212	681.5309	161.3517	0.0000	1201.7101	1721.8893
05/31/02	545.9552	681.5309	161.3517	0.0000	1201.7101	1721.8893
12/13/02	1165.7377	681.5309	161.3517	0.0000	1201.7101	1721.8893

Chironomus tentans

96-hr Freshwater Sediment Survival and Chemistry Results **AMEC Bioassay Laboratory**

Client: Internal (Sauget #4)
 Site ID: CuCl2
 Analysts: JR

Test Organism: C. tentans
 Start Date/Time: ~~12/13/2002~~ 12/17/02 1730
 End Date/Time: 12/21/02

Conc./ Site mg/L	Rep	Survival		Dissolved O ₂ (mg/L)					pH (pH units)					Cond. (umhos/cm)					Temperature (°C)				
		0	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
Cont.	A	10	7	8.4	6.8	6.0	5.6	6.3	7.76	7.81	7.72	7.77	7.61	834	818	795	794	795	20.4	20.3	20.3	20.2	20.2
	B	10	10																				
	C	10	10																				
	D	10	16																				
0.1975	A	10	10	8.6	7.2	6.5	6.0	6.5	7.77	7.87	7.69	7.74	7.65	831	810	786	786	787	20.3	20.3	20.3	20.2	20.2
	B	10	5																				
	C	10	7																				
	D	10	9																				
0.375	A	10	10	8.6	7.4	6.6	6.0	7.3	7.80	7.99	7.69	7.74	7.72	830	811	787	788	789	20.1	20.3	20.3	20.2	20.2
	B	10	9																				
	C	10	8																				
	D	10	9																				
0.75	A	10	1	8.6	4.0	7.0	6.4	7.4	7.76	7.91	7.70	7.74	7.76	827	805	782	782	782	20.1	20.3	20.3	20.3	20.2
	B	10	0																				
	C	10	1																				
	D	10	2																				
1.5	A	10	0	8.6	4.1	7.5	6.5	7.6	7.71	7.90	7.73	7.73	7.77	821	801	777	778	779	20.1	20.3	20.3	20.2	20.2
	B	10	0																				
	C	10	0																				
	D	10	1																				
3.0	A	10	0	8.6	4.1	7.9	6.9	8.0	7.57	7.76	7.75	7.76	7.81	812	795	771	771	772	20.3	20.2	20.2	20.2	20.2
	B	10	1																				
	C	10	0																				
	D	10	0																				

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B San Diego, CA 92121.

QA Check:

JP 1/1/03

Final Review:

JP 1/14/03

Chironomus tentans-96 Hr Survival

Start Date: 12/17/2002 Test ID: 021217CTRA Sample ID: REF-Ref Toxicant
 End Date: 12/21/2002 Lab ID: AEESD-AMEC Bioassay SD Sample Type: CUCL-Copper chloride
 Sample Date: Protocol: ASTM 93 Test Species: CT-Chironomus tentans
 Comments:

Conc-mg/L	1	2	3	4
L-Lab Control	0.7000	1.0000	1.0000	1.0000
0.1975	1.0000	0.5000	0.7000	0.9000
0.375	1.0000	0.9000	0.8000	0.9000
0.75	0.1000	0.0000	0.1000	0.2000
1.5	0.0000	0.0000	0.0000	0.1000
3	0.0000	0.1000	0.0000	0.0000

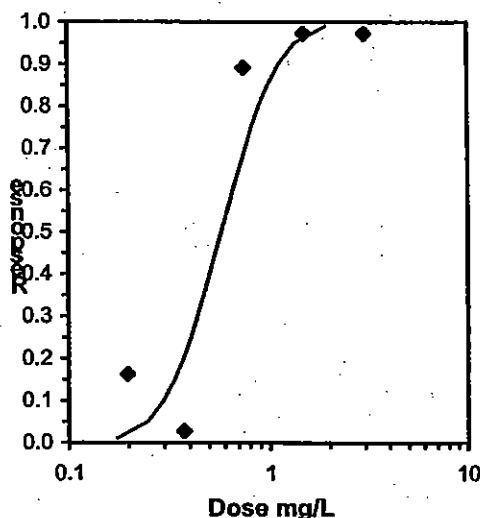
Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root				N	t-Stat	1-Tailed Critical	MSD	Number Resp	Total Number
			Mean	Min	Max	CV%						
L-Lab Control	0.9250	1.0000	1.3068	0.9912	1.4120	16.103	4				3	40
0.1975	0.7750	0.8378	1.1094	0.7854	1.4120	24.960	4	1.682	2.410	0.2828	9	40
0.375	0.9000	0.9730	1.2543	1.1071	1.4120	9.935	4	0.447	2.410	0.2828	4	40
*0.75	0.1000	0.1081	0.3165	0.1588	0.4636	39.374	4	8.438	2.410	0.2828	36	40
*1.5	0.0250	0.0270	0.1995	0.1588	0.3218	40.840	4	9.434	2.410	0.2828	39	40
*3	0.0250	0.0270	0.1995	0.1588	0.3218	40.840	4	9.434	2.410	0.2828	39	40

Auxiliary Tests

	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	0.94208	0.884	-0.4486	0.56314
Bartlett's Test indicates equal variances ($p = 0.25$)	6.62399	15.0863		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Dunnett's Test	0.375	0.75	0.53033	0.20231 0.21709 1.18828 0.02755 2.1E-09 5, 18

Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	4.45893	3.26583	-5.9344	14.8523	0.075	50.9184	7.81472	5.1E-11	-0.2389	0.22427	4
Intercept	6.0654	0.94048	3.07238	9.05842							
TSCR	0.11092	0.16567	-0.4163	0.63814							
Point	Probits	mg/L	95% Fiducial Limits								
EC01	2.674	0.17351									
EC05	3.355	0.2467									
EC10	3.718	0.29761									
EC15	3.964	0.33777									
EC20	4.158	0.37352									
EC25	4.326	0.40719									
EC40	4.747	0.50611									
EC50	5.000	0.57685									
EC60	5.253	0.65748									
EC75	5.674	0.8172									
EC80	5.842	0.89087									
EC85	6.036	0.98515									
EC90	6.282	1.11809									
EC95	6.645	1.34882									
EC99	7.326	1.91775									

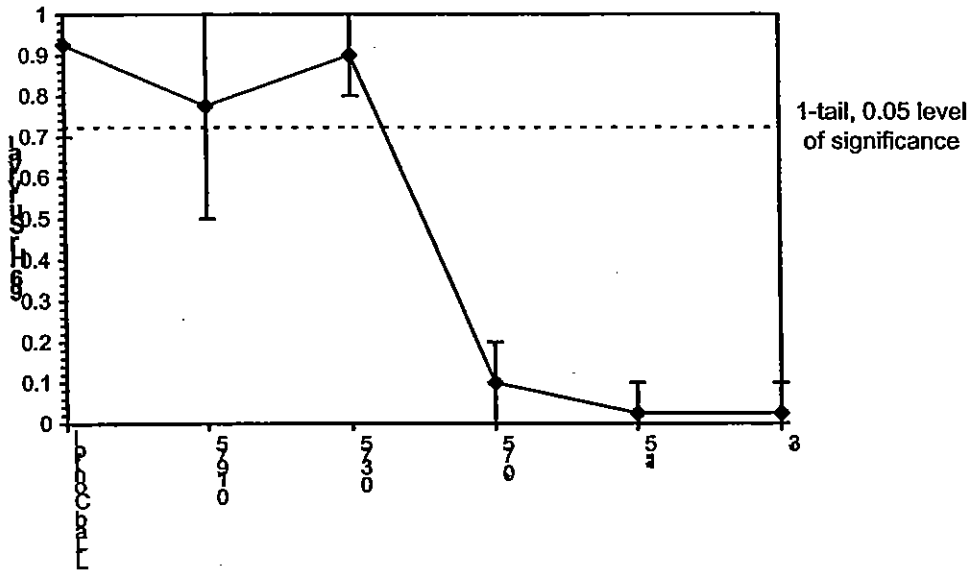
Significant heterogeneity detected ($p = 5.09E-11$)



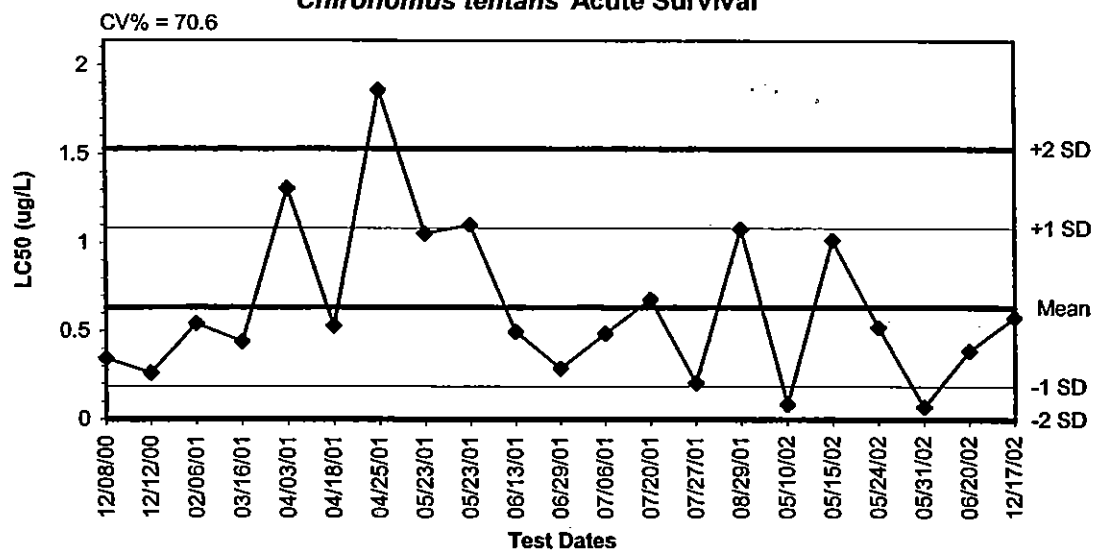
Chironomus tentans-96 Hr Survival

Start Date: 12/17/2002	Test ID: 021217CTRA	Sample ID:	REF-Ref Toxicant
End Date: 12/21/2002	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	CUCL-Copper chloride
Sample Date:	Protocol: ASTM 93	Test Species:	CT-Chironomus tentans
Comments:			

Dose-Response Plot



**Copper (II) Chloride Reference Toxicant Control Chart -
Chironomus tentans Acute Survival**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
12/08/00	0.3450	0.6340	0.1862	0.0000	1.0818	1.5296
12/12/00	0.2624	0.6340	0.1862	0.0000	1.0818	1.5296
02/06/01	0.5406	0.6340	0.1862	0.0000	1.0818	1.5296
03/16/01	0.4387	0.6340	0.1862	0.0000	1.0818	1.5296
04/03/01	1.3058	0.6340	0.1862	0.0000	1.0818	1.5296
04/18/01	0.5286	0.6340	0.1862	0.0000	1.0818	1.5296
04/25/01	1.8595	0.6340	0.1862	0.0000	1.0818	1.5296
05/23/01	1.0523	0.6340	0.1862	0.0000	1.0818	1.5296
05/23/01	1.1007	0.6340	0.1862	0.0000	1.0818	1.5296
06/13/01	0.4961	0.6340	0.1862	0.0000	1.0818	1.5296
06/29/01	0.2863	0.6340	0.1862	0.0000	1.0818	1.5296
07/06/01	0.4850	0.6340	0.1862	0.0000	1.0818	1.5296
07/20/01	0.6776	0.6340	0.1862	0.0000	1.0818	1.5296
07/27/01	0.2061	0.6340	0.1862	0.0000	1.0818	1.5296
08/29/01	1.0777	0.6340	0.1862	0.0000	1.0818	1.5296
05/10/02	0.0856	0.6340	0.1862	0.0000	1.0818	1.5296
05/15/02	1.0140	0.6340	0.1862	0.0000	1.0818	1.5296
05/24/02	0.5191	0.6340	0.1862	0.0000	1.0818	1.5296
05/31/02	0.0703	0.6340	0.1862	0.0000	1.0818	1.5296
06/20/02	0.3863	0.6340	0.1862	0.0000	1.0818	1.5296
12/17/02	0.5769	0.6340	0.1862	0.0000	1.0818	1.5296

Brachionus calyciflorus

Acute Exposure

Rotifer Test-24 Hr Survival

Start Date: 4/11/03 Test ID: RA041103BC Sample ID: REF-REFERENCE TOXICANT
 End Date: 4/12/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: KCR7-Potassium dichromate
 Sample Date: 4/11/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus
 Comments:

Conc-mg/L	1	2	3	4	5	6	7	8
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000	1.0000
20	0.6000	0.8000	0.8000	0.2000	0.6000	0.2000	0.8000	0.8000
40	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Number Resp	Total Number
			Mean	Min	Max	CV%	N				
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8			0	40
2.5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8	68.00	46.00	0	40
5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8	68.00	46.00	0	40
10	0.9750	0.9750	1.3155	1.1071	1.3453	6.400	8	64.00	46.00	1	40
*20	0.6000	0.6000	0.8910	0.4636	1.1071	31.522	8	36.00	46.00	16	40
*40	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	8	36.00	46.00	40	40

Auxiliary Tests

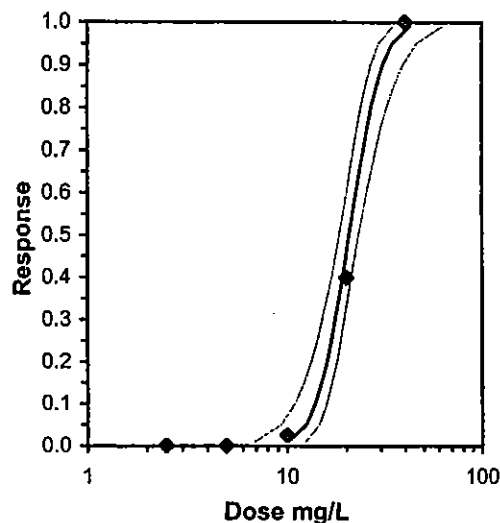
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$)
 Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)	Statistic	Critical	Skew	Kurt
Steel's Many-One Rank Test	0.56763	0.929	-1.9088	8.20118

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits	Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	7.43579	1.26571	4.95499 9.91659	0	2.23152	7.81472	0.53	1.31675	0.13448	5
Intercept	-4.791	1.67411	-8.0723 -1.5098							

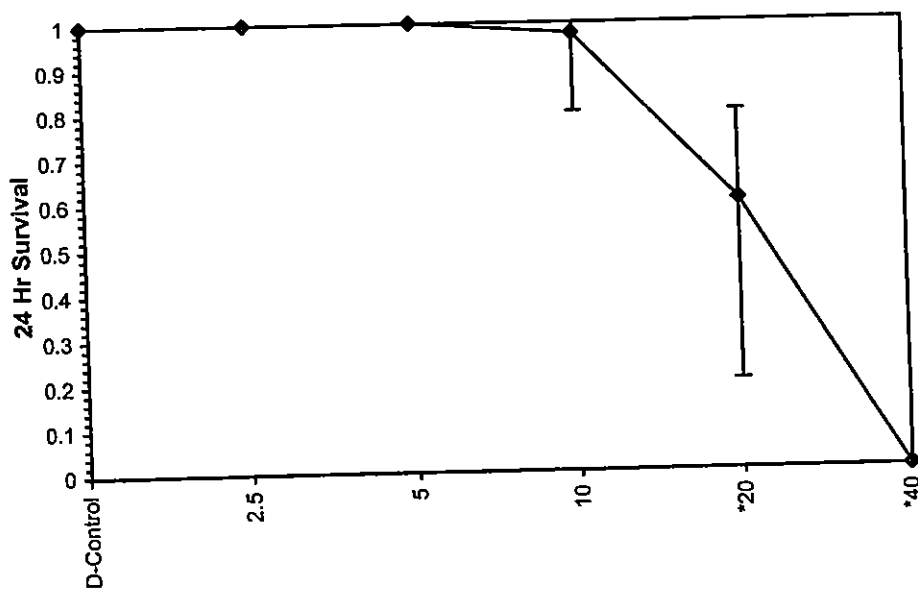
Point	Probits	mg/L	95% Fiducial Limits
EC01	2.674	10.0899	6.88693 12.3519
EC05	3.355	12.4606	9.37427 14.5909
EC10	3.718	13.9443	11.0185 15.9901
EC15	3.964	15.0439	12.2642 17.0421
EC20	4.158	15.9794	13.332 17.9568
EC25	4.326	16.8282	14.2993 18.8101
EC40	4.747	19.1723	16.8996 21.3448
EC50	5.000	20.737	18.5232 23.2343
EC60	5.253	22.4294	20.1506 25.4822
EC75	5.674	25.5538	22.8482 30.1393
EC80	5.842	26.9111	23.9291 32.3328
EC85	6.036	28.5845	25.2088 35.1543
EC90	6.282	30.8386	26.8628 39.1351
EC95	6.645	34.5107	29.4343 46.0065
EC99	7.326	42.6191	34.7645 62.6321



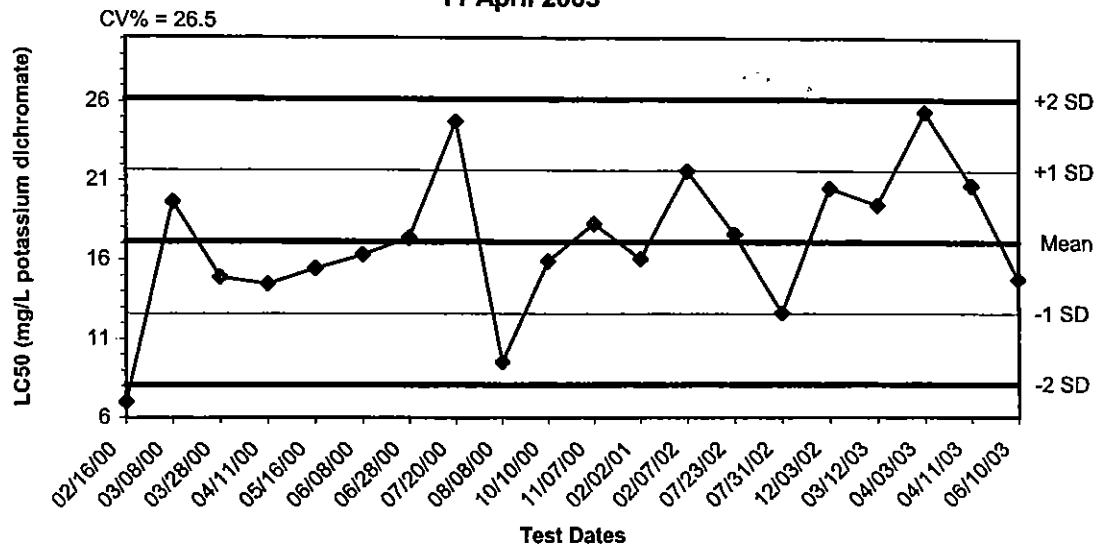
Rotifer Test-24 Hr Survival

Start Date: 4/11/03	Test ID: RA041103BC	Sample ID:	REF-REFERENCE TOXICANT
End Date: 4/12/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type:	KCR7-Potassium dichromate
Sample Date: 4/11/03	Protocol: ASTM E1440	Test Species:	BC-Brachionus calyciflorus
Comments:			

Dose-Response Plot



Control Chart - *Brachionus calyciflorus* Acute Survival
11 April 2003



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
02/16/00	6.9809	17.1151	12.5841	8.0531	21.6461	26.1771
03/08/00	19.6209	17.1151	12.5841	8.0531	21.6461	26.1771
03/28/00	14.8792	17.1151	12.5841	8.0531	21.6461	26.1771
04/11/00	14.4568	17.1151	12.5841	8.0531	21.6461	26.1771
05/16/00	15.4306	17.1151	12.5841	8.0531	21.6461	26.1771
06/08/00	16.2990	17.1151	12.5841	8.0531	21.6461	26.1771
06/28/00	17.3530	17.1151	12.5841	8.0531	21.6461	26.1771
07/20/00	24.7388	17.1151	12.5841	8.0531	21.6461	26.1771
08/08/00	9.4911	17.1151	12.5841	8.0531	21.6461	26.1771
10/10/00	15.9070	17.1151	12.5841	8.0531	21.6461	26.1771
11/07/00	18.2769	17.1151	12.5841	8.0531	21.6461	26.1771
02/02/01	16.0566	17.1151	12.5841	8.0531	21.6461	26.1771
02/07/02	21.6086	17.1151	12.5841	8.0531	21.6461	26.1771
07/23/02	17.6047	17.1151	12.5841	8.0531	21.6461	26.1771
07/31/02	12.6415	17.1151	12.5841	8.0531	21.6461	26.1771
12/03/02	20.5539	17.1151	12.5841	8.0531	21.6461	26.1771
03/12/03	19.4756	17.1151	12.5841	8.0531	21.6461	26.1771
04/03/03	25.4134	17.1151	12.5841	8.0531	21.6461	26.1771
04/11/03	20.7370	17.1151	12.5841	8.0531	21.6461	26.1771
06/10/03	14.7772	17.1151	12.5841	8.0531	21.6461	26.1771

Brachionus calyciflorus

Chronic Exposure

Rotifer Test-48 Hr

Start Date: 4/11/03 Test ID: RT041103BC Sample ID: REF-REFERENCE TOXICANT
End Date: 4/13/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: KCR7-Potassium dichromate
Sample Date: 4/11/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus
Comments:

Conc-mg/L	1	2	3	4	5	6	7	8
D-Control	4.0000	6.0000	4.0000	4.0000	5.0000	6.0000	4.0000	6.0000
1.25	4.0000	4.0000	5.0000	4.0000	4.0000	4.0000	5.0000	3.0000
2.5	4.0000	4.0000	2.0000	2.0000	3.0000	2.0000	0.0000	3.0000
5	0.0000	1.0000	1.0000	2.0000	0.0000	1.0000	3.0000	1.0000
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

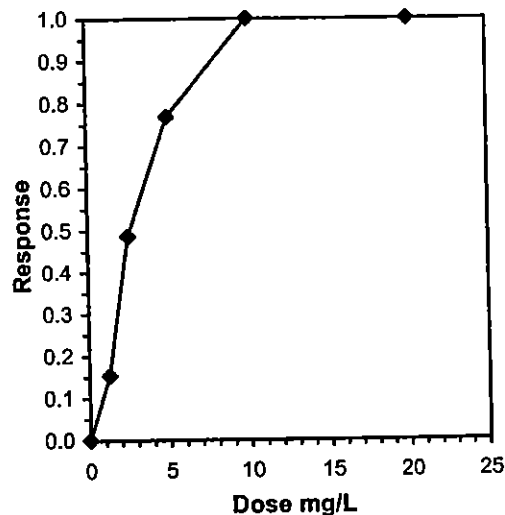
Conc-mg/L	Mean	N-Mean	Transform: Untransformed				N	Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%				Mean	N-Mean
D-Control	4.8750	1.0000	4.8750	4.0000	6.0000	20.329	8			4.8750	1.0000
1.25	4.1250	0.8462	4.1250	3.0000	5.0000	15.536	8	55.00	46.00	4.1250	0.8462
*2.5	2.5000	0.5128	2.5000	0.0000	4.0000	52.372	8	40.00	46.00	2.5000	0.5128
*5	1.1250	0.2308	1.1250	0.0000	3.0000	88.092	8	36.00	46.00	1.1250	0.2308
*10	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	8	36.00	46.00	0.0000	0.0000
*20	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	8	36.00	46.00	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.91765	0.929	-0.1445	1.72415
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	1.25	2.5	1.76777	

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05*	0.4063	0.3376	0.2238	1.3824	1.4917
IC10*	0.8125	0.3373	0.4477	1.5224	0.5110
IC15*	1.2188	0.3006	0.6715	1.7003	0.0103
IC20	1.4231	0.2702	0.8953	1.9323	-0.0256
IC25	1.6106	0.2742	1.1191	2.2225	0.4514
IC40	2.1731	0.3383	1.7286	3.0535	0.9042
IC50	2.6136	0.4633	2.0106	3.6538	0.5080

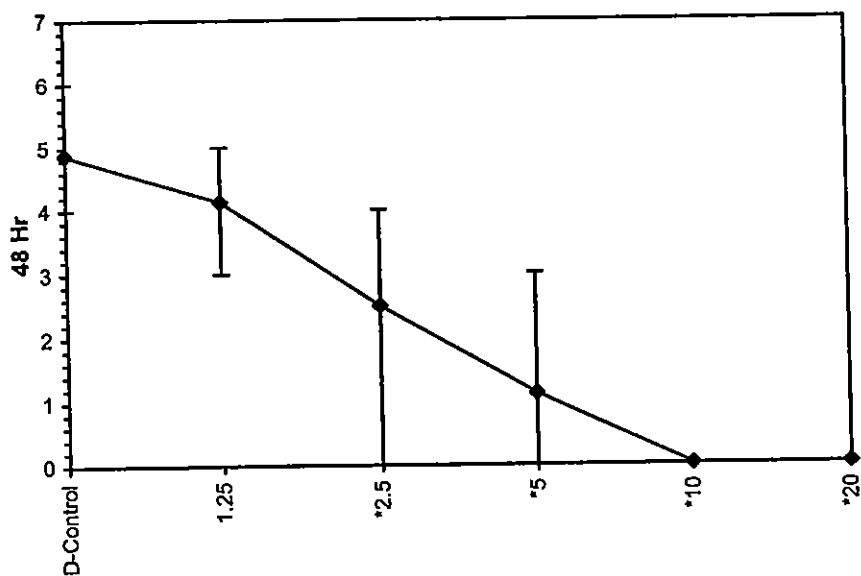
* indicates IC estimate less than the lowest concentration



Rotifer Test-48 Hr

Start Date: 4/11/03	Test ID: RT041103BC	Sample ID:	REF-REFERENCE TOXICANT
End Date: 4/13/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type:	KCR7-Potassium dichromate
Sample Date: 4/11/03	Protocol: ASTM E1440	Test Species:	BC-Brachionus calyciflorus
Comments:			

Dose-Response Plot



Rotifer Test-r

Start Date: 4/11/03 Test ID: RT041103BC Sample ID: REF-REFERENCE TOXICANT
End Date: 4/13/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: KCR7-Potassium dichromate
Sample Date: 4/11/03 Protocol: ASTM E1440 Test Species: BC-Brachionus calyciflorus
Comments:

Conc-mg/L	1	2	3	4	5	6	7	8
D-Control	0.6931	0.8959	0.6931	0.6931	0.8047	0.8959	0.6931	0.8959
1.25	0.6931	0.6931	0.8047	0.6931	0.6931	0.6931	0.8047	0.5493
2.5	0.6931	0.6931	0.3466	0.3466	0.5493	0.3466	0.5493	
5	0.0000	0.0000	0.3466	0.0000	0.5493	0.0000		

Conc-mg/L	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
D-Control	0.7831	1.0000	0.7831	0.6931	0.8959	12.860	8				0.7831	1.0000
1.25	0.7031	0.8978	0.7031	0.5493	0.8047	11.379	8	1.076	2.252	0.1676	0.7031	0.8978
*2.5	0.5035	0.6430	0.5035	0.3466	0.6931	31.402	7	3.630	2.252	0.1735	0.5035	0.6430
*5	0.1493	0.1907	0.1493	0.0000	0.5493	160.759	6	7.884	2.252	0.1811	0.1493	0.1907

Auxiliary Tests

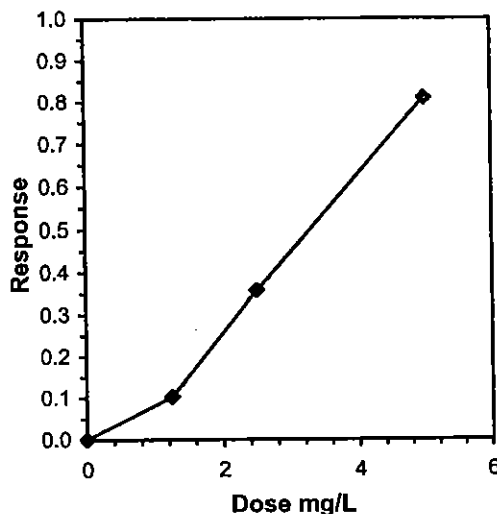
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$) 0.90193 0.898 0.83344 0.61247
Bartlett's Test indicates equal variances ($p = 0.04$) 8.10699 11.3449

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	1.25	2.5	1.76777		0.18105	0.23119	0.53204	0.02216	1.6E-07	3, 25

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05*	0.6114	0.3394	0.2317	1.6599
IC10*	1.2227	0.3014	0.4635	1.8258
IC15	1.4843	0.2666	0.8001	2.1401
IC20	1.7296	0.2661	1.1737	2.5774
IC25	1.9749	0.2894	1.4655	2.8325
IC40	2.7375	0.3445	2.0544	3.6362
IC50	3.2902			0.4735

* indicates IC estimate less than the lowest concentration



Rotifer Test-r

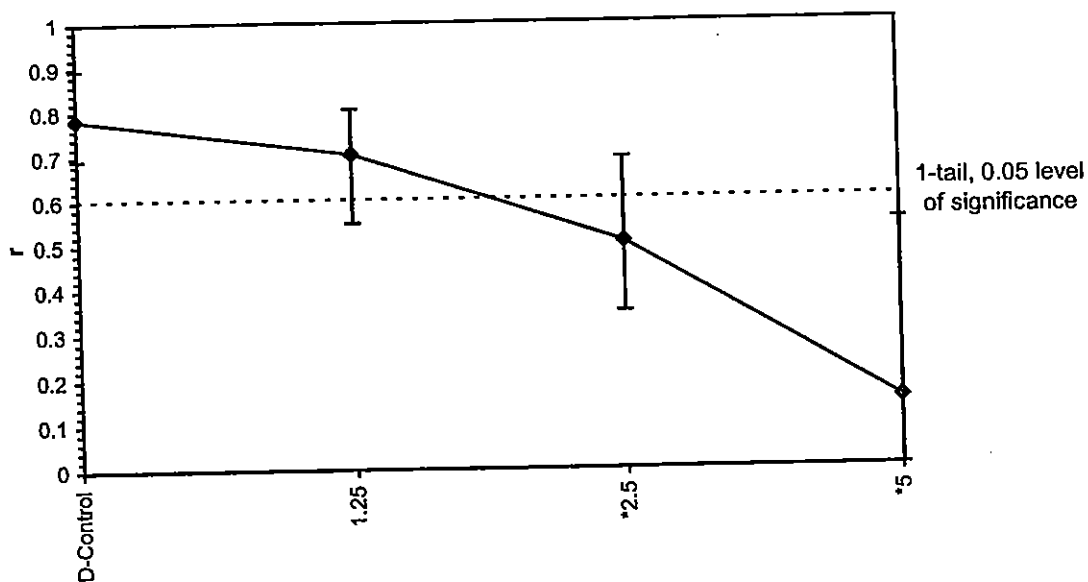
Start Date: 4/11/03
End Date: 4/13/03
Sample Date: 4/11/03
Comments:

Test ID: RT041103BC
Lab ID: WAAEE-AMEC NW Bioassay
Protocol: ASTM E1440

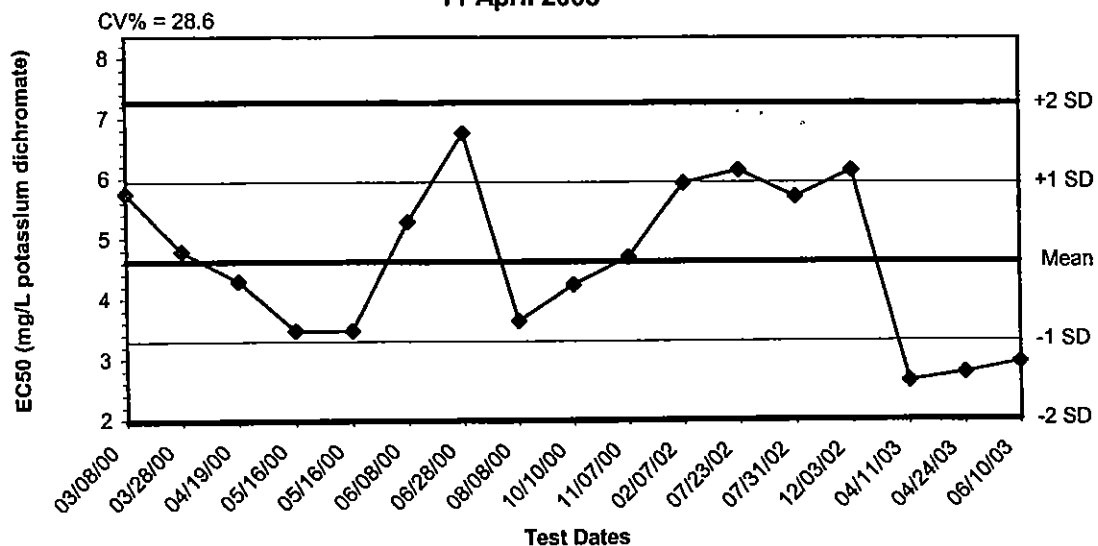
Sample ID:
Sample Type:
Test Species:

REF-REFERENCE TOXICANT
KCR7-Potassium dichromate
BC-Brachionus calyciflorus

Dose-Response Plot



Control Chart - *Brachionus calyciflorus* Chronic Population Increase
11 April 2003



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
03/08/00	5.7500	4.6205	3.2970	1.9736	5.9439	7.2673
03/28/00	4.7857	4.6205	3.2970	1.9736	5.9439	7.2673
04/19/00	4.2949	4.6205	3.2970	1.9736	5.9439	7.2673
05/16/00	3.4722	4.6205	3.2970	1.9736	5.9439	7.2673
05/16/00	3.4722	4.6205	3.2970	1.9736	5.9439	7.2673
06/08/00	5.2778	4.6205	3.2970	1.9736	5.9439	7.2673
06/28/00	6.7568	4.6205	3.2970	1.9736	5.9439	7.2673
08/08/00	3.6310	4.6205	3.2970	1.9736	5.9439	7.2673
10/10/00	4.2361	4.6205	3.2970	1.9736	5.9439	7.2673
11/07/00	4.6875	4.6205	3.2970	1.9736	5.9439	7.2673
02/07/02	5.9211	4.6205	3.2970	1.9736	5.9439	7.2673
07/23/02	6.1364	4.6205	3.2970	1.9736	5.9439	7.2673
07/31/02	5.7000	4.6205	3.2970	1.9736	5.9439	7.2673
12/03/02	6.1364	4.6205	3.2970	1.9736	5.9439	7.2673
04/11/03	2.6136	4.6205	3.2970	1.9736	5.9439	7.2673
04/24/03	2.7500	4.6205	3.2970	1.9736	5.9439	7.2673
06/10/03	2.9261	4.6205	3.2970	1.9736	5.9439	7.2673

Appendix E
Chain-of-Custody Forms



June 6, 2002

Mr. Steve Carlson
Laboratory Manager
AMEC Earth & Environmental Bioassay
5550 Morehouse Drive, Suite B
San Diego, CA 92121

Dear Mr. Carlson,

Enclosed are the three chemicals that Paul Anderson asked I send to you to assess the toxicity via a *Selenastrum capricornutum* bioassay:

- Four 25 gram bottles of benzene sulfonic acid, sodium salt (515-42-4, Aldrich Chemical)
- One 100 g bottle of 4-hydroxybenzenesulphonic acid, sodium salt (825-90-1, Avocado Research)
- One 100 g bottle of benzene-1,3-disulfonic acid, sodium salt (831-59-4, Avocado Research).

Note that these chemicals are hygroscopic so they should be kept tightly capped and stored in a clean, dry area.

I can be contacted at AMEC's Westford, Massachusetts office at 978-692-9090, x248 if you have any questions or concerns regarding these compounds.

Sincerely,

A handwritten signature in dark ink, appearing to read "Stephen R. Clough".

Stephen R. Clough, Ph.D., DABT
Sr. Ecological Risk Assessor

cc: Paul Anderson, Marilyn Hoyt

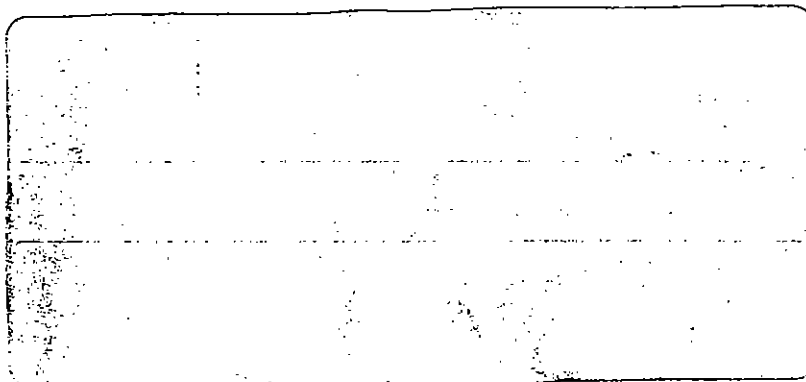
AMEC Earth & Environmental, Inc.
239 Littleton Road, Suite 1B
Westford, MA 01886 USA
Tel (978) 692-9090
Fax (978) 692-6633 www.amec.com



SIGMA-ALDRICH

SIGMA • 3300 SOUTH SECOND STREET • ST. LOUIS, MO 63118 USA
Customer Service 800-325-8070 and Technical Service 800-325-5832
Fax: 800-325-5052
<http://www.sigmaaldrich.com>

P TO:
MEC EARTH & ENVIRONMENTAL
EVE CARLSON
SAN DIEGO BIOASSAY LAB
SUITE B
350 MOREHOUSE DR
SAN DIEGO CA 92121



PAGE 1 of 1		DELIVERY # 811824822			
DATE	SOLD TO ACCT	SOLD TO NAME	PURCHASE ORDER NUMBER	REFERENCE	
20/2002	49473116	AMEC EARTH & ENVIRONMENTAL	CC/112002/SCHNEPP	7217181	
ROUTE		PERSON TO CONTACT	PHONE NUMBER		
EX OVERNIGHT		PAMELA SCHNEPPER	9786929090		
SHIPPING POINT					
STOCK NO	LOT NO	ORDERED	SHIPPED	BACK ORD	DESCRIPTION
R5645-5006	042K3448	1	1	0	RESORCINOL SIGMAULTRA
					CNTRY OF OR: CH
					58.35/4.18
					58.35
					UN2876 III 001 KEEP AWAY FROM FOOD
					NO POISON PACK REQUIRED
					PASS 100.000 KG C60
					POISON LABEL FOR FEED
					200.000 KG
					Over 700 New Products Available Now!
					See the New 2003/2004 Aldrich Handbook
					Visit our web site at www.sigma-aldrich.com/aldrichnew today!
					Sub Total
					Trans / Handling
					31.58
					Total Tax
					92.29
					TOTAL

le
GMA-ALDRICH
mily

SIGMA
Biochemicals and
Reagents for Life
Science Research

Fluka
Specialty Chemicals
and Analytical
Reagents for Research

ALDRICH
Organics and
Inorganics for
Chemical Synthesis

Riedel
Laboratory Chemicals
and Reagents for
Research and Analysis

SUPELCO
Chromatography
Products for Analysis
and Purification

ALL SALES ARE EXPRESSLY LIMITED TO AND CONDITIONED UPON THE TERMS AND CONDITIONS APPEARING ON THE FRONT AND BACK OF THIS FORM.
SIGMA-ALDRICH BRAND PRODUCTS ARE SOLD THROUGH SIGMA-ALDRICH, INC.

STATEMENTS OF POLICY

DEPARTMENT OF ENVIRONMENTAL PROTECTION

[25 PA. CODE CH. 16]

Request for Scientific Information; Resorcinol and Sulfonates; Statement of Policy

The Department of Environmental Protection (Department) is seeking analytical test methods, data and pertinent scientific information for Benzene Metadisulfonic Acid (BDSA), Benzene Monosulfonic Acid (BSA), p-Phenol Sulfonic Acid (p-PSA), (collectively referred to as the sulfonates) and Resorcinol.

The Department plans to propose amendments to Chapter 16, Appendix A, Table 1A (relating to water quality criteria for toxic substances). The revision to Table 1A will incorporate site-specific ambient water quality criteria for BDSA, BSA, p-PSA and Resorcinol, which were requested by AMEC Earth & Environmental (AMEC), a consultant to Beazer East, Inc. (Beazer East). Documentation to support the request was submitted to the Department on April 11, 2008, by Babst, Calland, Clements and Zomnir, on behalf of Beazer East.

For further information contact Richard H. Shertzer, Chief, Division of Water Quality Standards, Bureau of Water Standards and Facility Regulation, 11th Floor, Rachel Carson State Office Building, P. O. Box 8467, Harrisburg, PA 17105-8467, (717) 787-9637 or Michelle Moses, Assistant Counsel, Bureau of Regulatory Counsel, 9th Floor, Rachel Carson State Office Building, P. O. Box 8464, Harrisburg, PA 17105-8464, (717) 787-7060. Persons with a disability may use the Pennsylvania AT&T Relay Service at (800) 654-5984 (TDD user) or (800) 654-5988 (voice users).

Beazer East has implemented environmental investigations and remediation at sites in Butler and Armstrong Counties, in cooperation with the Department and United States Environmental Protection Agency (EPA). These

sites are located within an area approximately 60 square miles in size that has been designated by the Department under the Hazardous Sites Cleanup Act (HSCA) as the "Bear Creek Area Chemical Site" (BCACS). The Department has determined that environmental media (such as, soil and groundwater) within the BCACS have been impacted by the sulfonates and resorcinol. Currently, with respect to surface water, there are no ambient water quality criteria in Chapter 16 for the sulfonates or resorcinol.

Because water quality criteria have not been developed for the sulfonates or resorcinol by either the Department or the EPA, AMEC used the EPA's National guidelines to develop water quality criteria as stated in 25 Pa. Code § 16.22 (relating to criteria development).

The Department reviewed materials presented during a March 7, 2007, meeting with representatives of Beazer East, AMEC, Babst, Calland, Clements and Zomnir and draft reports prepared on behalf of Beazer East. The EPA performed an informal review of this documentation and the process used by AMEC. Based on comments forwarded to the Department from the EPA's Health and Ecological Criteria Division in the EPA Office of Science and Technology, it was determined that AMEC followed the EPA National Guidelines on toxicity testing and criteria development. However, based on a more thorough review of the calculations and data tables, the EPA provided additional recommendations to correct errors found in some reported values. AMEC revised its ambient water quality report at the request of Beazer East, and updated the report titled "Development of Ambient Water Quality Criteria for Benzene Metadisulfonic Acid, Benzene Monosulfonic Acid, p-Phenol Sulfonic Acid and Resorcinol." This report, dated April 3, 2008, incorporates revisions provided by the EPA and the Department.

Based on the results of studies presented by AMEC on behalf of Beazer East, using established EPA protocols, the Department plans to propose the following site-specific ambient water quality criteria for Sulfonates and Resorcinol. These criteria will apply to the BCACS located within Bear Creek basin (§ 93.9s), in Armstrong and Butler Counties.

<i>Compound</i>	<i>CAS Number</i>	<i>Acute AWQC Criterion Maximum Concentration (ug/l)</i>	<i>Chronic AWQC Criterion Continuous Concentration (ug/l)</i>
Benzene Metadisulfonic Acid	00098486	2592000	1620000
Benzene Monosulfonic Acid	00098113	1956000	1151000
p-Phenol Sulfonic Acid	00098679	3476000	1363000
Resorcinol	01084603	28000	7180

Analytical test methods, data and pertinent scientific information should be submitted to Richard H. Shertzer at the previous address, or may be submitted electronically by e-mail to RA-WQS@state.pa.us. A subject heading of "Request for Information—Resorcinol," and return name and address must be included in each transmission. Comments and scientific information must be received by June 22, 2009, to be considered in the development of the final criteria for Metadisulfonic Acid, Benzene Monosulfonic Acid, p-Phenol Sulfonic Acid and Resorcinol. Comments received by facsimile will not be accepted.

Persons with a disability may use the Pennsylvania AT&T Relay Service at (800) 654-5984 (TDD user) or (800) 654-5988 (voice users).

JOHN HANGER,
Secretary

[Pa.B. Doc. No. 09-929. Filed for public inspection May 22, 2009, 9:00 a.m.]